DELTA ELEKTRONIKA BV

P.O. BOX 27
4300 AA ZIERIKZEE
NETHERLANDS
TEL. +31 111 413656
FAX. +31 111 416919
www.DeltaPowerSupplies.com

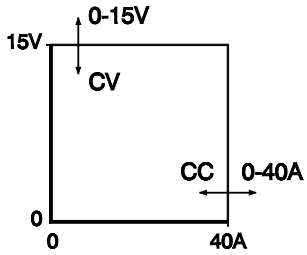
SM 700 - series

600 / 700 watts DC POWER SUPPLIES

CE

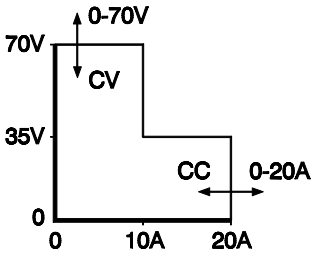
SM 1540-D

* 600 W
* 0 - 15 V 0 - 40 A



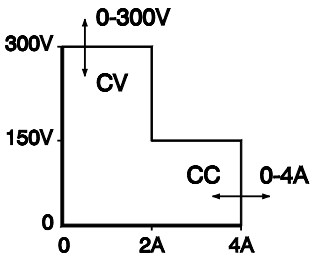
SM 7020-D

* 700 W
* AUTORANGING
  0 - 35 V 0 - 20 A
  35 - 70 V 0 - 10 A



SM 3004-D

* 600 W
* AUTORANGING
  0 - 150 V 0 - 4 A
  150 - 300 V 0 - 2 A



- Efficiency 90 %
- Weight only 7.4 kg
- 100 kHz MOSFET power conversion technique
- 0 - 5 V analog programmable (voltage and current)
- Isolated analog programming with ISO AMP MODULE to prevent earth loops
- **IEEE488, RS232** or **Ethernet** programming with external interface PSC-488 module, PSC-232 module, PSC-ETH module (pin compatible)
- Master / Slave parallel and series operation with equal current and voltage sharing
- Input / output insulation 3750 Vrms
- Designed for long life at full power
- Voltage and current control with 10 turn potentiometers, resolution 0.03%
- Natural convection cooling, no blower, no noise
- 48 hours burn-in

	SM 1540-D	SM 7020-D	SM 3004-D
Output			
voltage range	0 - 15 V	0 - 70 V	0 - 300 V
current range	0 - 40 A	0 - 20 A	0 - 4 A
max. output power	600 W	700 W	600 W
AUTORANGING (2 ranges)	no	yes	yes
max. output **current** / volt. range	40 A / 0 - 15 V -	20 A / 0 - 35 V 10 A / 35 - 70 V	4 A / 0 - 150 V 2 A / 150 - 300 V
Input			
AC input, 48 - 62 Hz 110 V range	90 - 132 V	95 - 132 V	95 - 132 V
230 V range	185 - 265 V	192 - 265 V	192 - 265 V
current (110 V AC)	8.4 Arms	9.6 Arms	8.3 Arms
current (230 V AC)	3.9 Arms	4.5 Arms	3.9 Arms
DC input	contact factory	contact factory	contact factory
fuses 230 / 110 V	8 AT / 16 AT	8 AT / 16 AT	8 AT / 16 AT
standby input power (V_o=I_o=0)	7.5 W	7.5 W	7.5 W
standby input power (V_o=$V_{max.}$)	13.5 W	16.5 W	21.5 W
Efficiency			
AC input, full load	87 %	89 %	88 %
Regulation			
Load 0 - 100% **CV**	5 mV	5 mV	20 mV
Line 192 - 265 V AC **CV**	5 mV	5 mV	20 mV
Load 0 - 100% **CC**	25 mA	12 mA	3 mA
Line 192 - 265 V AC **CC**	25 mA	12 mA	3 mA
Ripple + noise			
rms (BW=300 kHz) **CV**	2 mV	3 mV	10 mV
pp (BW=50 MHz) **CV**	10 mV	15 mV	50 mV
rms (BW=300 kHz) **CC**	10 mA	5 mA	1 mA
pp (BW=50 MHz) **CC**	25 mA	15 mA	3 mA
Temp. coeff., per °C **CV**	5.10^{-5}		
CC	1.10^{-4}		
Stability			
during 8 hrs after **CV**	3.10^{-4}		
1 hr warm-up and t_{amb} = 25 ± 1 °C **CC**	1.10^{-3}		

Analog Programming	**CV**	**CC**
Programming inputs		
input range	0 - 5 V	0 - 5 V
accuracy	± 0.2% + 0 mV ... + 8 mV (on 5 V)	± 0.5% + 0 mV ... + 20 mV (on 5 V)
temp. coeff. offset	10 µV / °C	150 µV / °C
input impedance	1 MOhm	1 MOhm
Monitoring output		
output range	0 - 5 V	0 - 5 V
accuracy	± 0.2% – 3 mV ... + 11 mV (on 5 V)	± 0.5% – 5 mV ... + 0 mV (on 5 V)
temp. coeff. offset	10 µV / °C	150 µV / °C
output impedance	20 Ohm	20 Ohm

Reference voltage	
on prog. connector V_{ref}	5.165 ± 31 mV
TC	typical 12 ppm / max. 30 ppm
Status outputs	
CC-status	5 V / 10 mA = logic 1
OVP / OVL-status	5 V / 10 mA = logic 1
Remote ShutDown	with + 5 V or relay contact

Programming speed	SM 1540-D		SM 7020-D		SM 3004-D	
programming UP						
settling within	50 mV	500 mV	50 mV	1 V	200 mV	5 V
output voltage step	0 → 15 V	0 → 15 V	0 → 35 V	0 → 35 V	0 → 150 V	0 → 150 V
time, (100 % load)	30 ms	18 ms	50 ms	12 ms	50 ms	14 ms
time, (10 % load)	30 ms	10 ms	50 ms	12 ms	40 ms	12 ms
output voltage step	-	-	0 → 70 V	0 → 70 V	0 → 300 V	0 → 300 V
time, (100 % load)	-	-	100 ms	40 ms	100 ms	60 ms
time, (10 % load)	-	-	100 ms	12 ms	60 ms	16 ms
programming DOWN						
settling within	50 mV	500 mV	50 mV	1 V	200 mV	5 V
output voltage step	15 → 0.5 V	15 → 0.5 V	35 → 2 V	35 → 2 V	150 → 10 V	150 → 10 V
time, (100 % load)	30 ms	20 ms	50 ms	10 ms	50 ms	14 ms
time, (10 % load)	200 ms	200 ms	200 ms	100 ms	180 ms	120 ms
output voltage step	-	-	70 → 2 V	70 → 2 V	300 → 10 V	300 → 10 V
time, (100 % load)	-	-	100 ms	55 ms	100 ms	70 ms
time, (10 % load)	-	-	800 ms	120 ms	800 ms	700 ms
Programming bandwidth						
small signal	50 Hz		50 Hz		50 Hz	
large signal, 100 % load	50 Hz		50 Hz		50 Hz	
large signal, 10 % load	5 Hz		5 Hz		5 Hz	

	SM 1540-D	SM 7020-D	SM 3004-D
Recovery time			
recovery within	50 mV	50 mV	300 mV
di/dt of load step	4 A/µs	2 A/µs	0.5 A/µs
time, @ 50 - 100% load step	100 µs	150 µs	100 µs
max. deviation(high / low outp. range)	200 mV	80 / 150 mV	450 / 900 mV
@230 V AC input, internal sensing			
Noise suppression			
line - line ⇒ output	88 dB	82 dB	75 dB
line - earth ⇒ output	88 dB	88 dB	75 dB
Output impedance			
CV, 0-100 kHz	< 40 mOhm	< 60 mOhm	< 700 mOhm
Pulsating load			
max. tolerable AC component of load current			
f > 1 kHz	10 Arms	5 Arms	1 Arms
f < 1 kHz	40 A peak	20 / 10 A peak	4 / 2 A peak

Insulation	
input / output	3750 Vrms (1 min.)
creepage / clearance	8 mm
input / case	2500 Vrms (1 min.)
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
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 100% load Vin = 230 V AC 50% load Vin = 230 V AC	 20 ms 45 ms
Turn on delay after mains switch on	 500 ms
Inrush current	6,5 A @ 230 V AC input 30 A @ 110 V AC input

	SM 1540-D	**SM 7020-D**	**SM 3004-D**
Series operation max. total voltage Master / Slave operation	 600 V yes	 600 V yes	 600 V yes
Parallel operation max. total current Master / Slave operation	 no limit yes	 no limit yes	 no limit yes
Remote sensing max. voltage drop per load lead	2 V => total voltage drop will substract from max. available Vout		not available
OVP / OVL adjust range	0 - 17 V	0 - 80 V	0 - 350 V

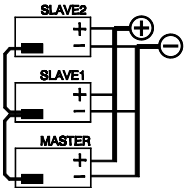
Potentiometers front panel control with knobs resolution screwdriver adjustment at front panel at rear panel	 standard 0.03 % Option P001 Option P002	 standard 0.03 % Option P001 Option P002	 standard 0.03 % Option P001 Option P002
Meters scale voltage scale current accuracy	3.5 digit 0 - 15.00 V 0 - 40.0 A 0.5% + 2 digits	3.5 digit 0 - 70.0 V 0 - 20.0 A 0.5% + 2 digits	3.5 digit 0 - 300 V 0 - 4.00 A 0.5% + 2 digits

Input Terminals input connections	10 Amp / 65 °C Euro-connector at rear panel		
Output Terminals at rear panel	M8 bolts	6 mm bind post	4 mm bind post
Programming connector	15 pole D-connector at rear panel (FEMALE)		
Cooling	convection cooling		
Enclosure degree of protection	IP20		
Dimensions behind front panel (h x w x d) front panel (h x w)	89 x 428 x 257 mm (with Option P099, feet are removed) 89 x 483 mm (19", 2 U)		
Weight	7.4 kg		

Screwdriver adjustment OPTION P001

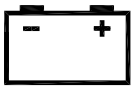
- For a **fixed setting** of the output values, avoids accidental adjusting of the CV and CC settings.
- The potmeters are moved backwards just behind the front panel and plastic caps are inserted to cover the holes, see picture.

Master / Slave operation



- Parallel and Series operation with equal Current and Voltage sharing.
- This way two or more SM-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 15p shielded cables (1:1)

Battery Charging OPTION P021/022



- The CV / CC regulated power supplies are ideal battery chargers.
  Once set at the correct output voltage, the battery will charge constantly without overcharging.
  This can be useful for **emergency power systems**.
- Use a circuit breaker in series to protect the internal diode from reverse connection of the battery.
- Some units need an **external diode set** on the output as extra protection for the internal diode.
- *Ordering information for diode set:*

	SM 7020-D	SM 3004-D
option number	P021	P022

Download the special datasheet for more details from 'www.DeltaPowerSupplies.com'.

Increased max. output voltage/current OPTION P069

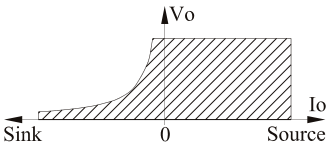
- The maximum output voltage or current can be increased by approximately 10%.
  Normally this results in a derating of the maximum ambient temperature or other parameters.
- Always add increased value for voltage or current in ordercode, for example **SM 7020-D P069 output 76 V**

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 .

Power Sink for 2 quadrant operation OPTION P140/141



- Can absorb **70 W peak power.**
- Maintains output voltage regardless output power is positive or negative (source & sink).
- Ideal solution for supplying **electric motors** with PWM-speed control.
- Fast down programming at no load conditions.
- *Ordering information:*

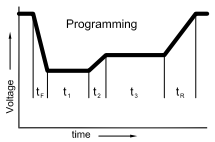
	SM 1540-D	SM 7020-D
option number	P140	P141

Download the special datasheet for more details from 'www.DeltaPowerSupplies.com'.

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.

External Ethernet Power Supply Controller PSC-ETH module



- External Ethernet compatible Controller to program a unit by a computer.
- Pin compatible with the programming connector on the rear side.
- Bench operation and rail mounting.
- *Available at the end of 2005.*

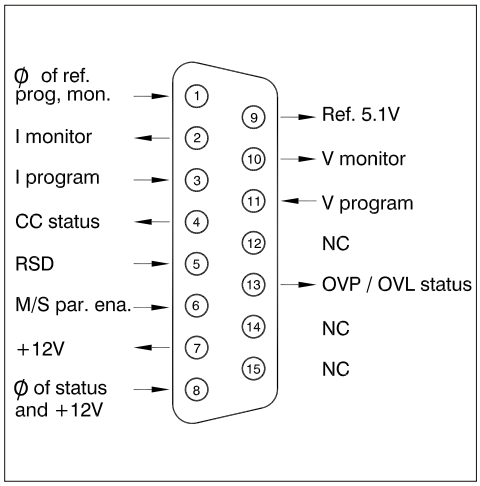
External RS232 Power Supply Controller PSC-232 module

- External RS232 compatible Controller to program a unit by a computer.
- Pin compatible with the programming connector on the rear side.
- Bench operation and rail mounting.

External IEEE488 Power Supply Controller PSC-488 module

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

Note: there is only room to connect one of the external modules to the programming connector.



Connections programming connector

CV= Constant Voltage
CC=Constant Current
OVL=Over Voltage Limit=
OVP=Over Voltage Protection

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