

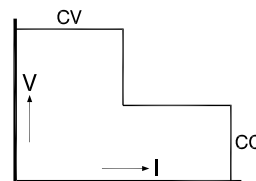
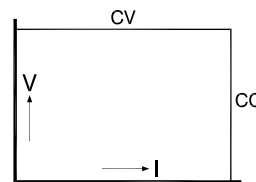


SM 1500 - series
1500 watts DC POWER SUPPLIES

SM 15-100	0 - 15 V	0 - 100 A
SM 35-45	0 - 35 V	0 - 45 A
SM 52-30	0 - 52 V	0 - 30 A
SM 70-22	0 - 70 V	0 - 22 A
SM 120-13	0 - 120 V	0 - 13 A
SM 300-5	0 - 300 V	0 - 5 A

Autoranging

SM 52-AR-60	0 - 26 V	0 - 60 A
	0 - 52 V	0 - 30 A
SM 400-AR-8	0 - 200 V	0 - 8 A
	0 - 400 V	0 - 4 A



- Efficiency up to 91 %.
- Weight only 9.9 kg
- Wide input voltage range:
90 - 265 V AC, 48-62 Hz
- Active Power Factor Correction, PF=0.99
- 100 kHz MOSFET power conversion technique
- 0 - 5 V analog programmable
(on both voltage and current)
- Isolated analog programming with optional
ISO AMP CARD to prevent earth loops
- **Ethernet, CAN/PROFI-Bus, IEEE488** or **RS232**
programming with optional interface cards
- Very low HF-emission, OK for **light** industrial envi-
ronment, immunity OK for **industrial** environment

- Very low output ripple and spikes
- Very stable output voltage or current ($6 \cdot 10^{-5} - 10^{-4}$)
- Excellent dynamic response to load changes
- Master / Slave parallel and series operation with
equal current and voltage sharing
- Designed for long life at full power
- Protected against all overload and short circuit
conditions
- V and I control with 10-turn potentiometers,
resolution 0.03 %. Optional with digital encoders
- Silent blower, only runs when needed, variable
speed
- 48 hours burn-in

	SM 15-100	SM 35-45	SM 52-30	SM 52-AR-60	SM 70-22	SM 120-13	SM 300-5	SM 400-AR-8
Output voltage current AUTORANGING (2 ranges) max. output current / voltage	0 - 15 V 0 - 100 A no -	0 - 35 V 0 - 45 A no -	0 - 52 V 0 - 30 A no -	0 - 52 V 0 - 60 A yes 60 A / 0-26 V 30 A / 26-52 V	0 - 70 V 0 - 22 A no -	0 - 120 V 0 - 13 A no -	0 - 300 V 0 - 5 A no -	0 - 400 V 0 - 8 A yes 8 A / 0-200 V 4 A / 200-400 V
Input AC single phase, 48 - 62 Hz rated voltage range rated frequency <i>Power Derating vs input:</i> 90 V : P _{out max} (W), I _{in} (A) 100 V : P _{out max} (W), I _{in} (A) 110 V : P _{out max} (W), I _{in} (A) 230 V : P_{out max} (W), I_{in} (A) power factor, 100%, 50% load internal fuses standby input power (V _o =I _o =0) standby input power (V _o =V _{max})	90 - 265 V 100 - 240 V 50 / 60 Hz 1170, 16 1317, 16 1492, 16 1500, 7.5 0.99, 0.98 25 AT 12 W 22 W	90 - 265 V 100 - 240 V 50 / 60 Hz 1185, 16 1334, 16 1498, 16 1575, 7.7 0.99, 0.98 25 AT 12 W 22 W	90 - 265 V 100 - 240 V 50 / 60 Hz 1200, 16 1350, 16 1505, 16 1560, 7.7 0.99, 0.98 25 AT 12 W 22 W	90 - 265 V 100 - 240 V 50 / 60 Hz 1200, 16 1350, 16 1505, 16 1560, 7.7 0.99, 0.98 25 AT 12 W 22 W	90 - 265 V 100 - 240 V 50 / 60 Hz 1200, 16 1350, 16 1505, 16 1540, 7.6 0.99, 0.98 25 AT 12 W 22 W	90 - 265 V 100 - 240 V 50 / 60 Hz 1200, 16 1350, 16 1505, 16 1560, 7.7 0.99, 0.98 25 AT 12 W 22 W	90 - 265 V 100 - 240 V 50 / 60 Hz 1200, 16 1350, 16 1500, 16 1500, 7.4 0.99, 0.98 25 AT 12 W 22 W	90 - 265 V 100 - 240 V 50 / 60 Hz 1200, 16 1350, 16 1505, 16 1600, 7.8 0.99, 0.98 25 AT 12 W 25 W
				26 V / 52 V				200 V / 400 V
Efficiency AC 230 V input, full load AC 115 V input, max. load	87 % 83 %	90 % 86 %	90 % 86 %	89 / 90 % 84%	90 % 86 %	90 % 86 %	91 % 86 %	90 / 91 % 86%
Regulation								
Load 0 - 100% CV Line 120 - 265 V AC CV (measured on sense block)	0.5 mV 0.2 mV	1 mV 0.5 mV	2 mV 0.7 mV	2 mV 0.7 mV	2.5 mV 1 mV	4 mV 2 mV	10 mV 3 mV	12 mV 4 mV
Load 0 - 100% CC Line 120 - 265 V AC CC (internal voltage sense)	5 mA 1 mA	3 mA 0.5 mA	1.5 mA 0.5 mA	2 mA 1 mA	1 mA 0.25 mA	0.6 mA 0.2 mA	0.5 mA 0.1 mA	0.5 mA 0.2 mA
Ripple + noise rms (BW=300 kHz) CV p-p (BW=50 MHz) CV rms (BW=300 kHz) CC p-p (BW=50 MHz) CC CC-ripple at full load	2 mV 8 mV 15 mA 80 mA	1.8 mV 8 mV 5 mA 15 mA	2 mV 15 mV 3 mA 10 mA	2 mV 15 mV 10 / 3 mA 30 / 10 mA	3 mV 15 mV 3 mA 10 mA	7 mV 30 mV 2 mA 6 mA	7 mV 50 mV 0.5 mA 4 mA	15 mV 80 mV 1.2 / 0.6 mA 6 / 3 mA
Temp. coeff., per °C CV CC				35.10 ⁻⁶ 60.10 ⁻⁶				
Stability after 1 hr warm-up during 8 hrs CV CC t _{amb} = 25 ± 1 °C, V _{in} = 230 V AC (int. voltage sensing for CC-stab.)				6.10 ⁻⁵ 9.10 ⁻⁵				

Analog Programming	CV	CC
Programming inputs input range accuracy offset temp. coeff. offset input impedance	0 - 5 V ± 0.2% - 0.1 ... +1.3 mV (on 5V) 10 μV / °C > 1 MOhm	0 - 5 V ± 0.5% 0 ... +2.2 mV (on 5V) 50 μV / °C > 1 MOhm
Monitoring output output range accuracy offset temp. coeff. offset output impedance	0 - 5 V ± 0.2% - 1... 0 mV (on 5V) 3 μV / °C 2 Ohm / max. 4 mA	0 - 5 V ± 0.5% - 1.1... 0 mV (on 5V) 60 μV / °C 2 Ohm / max. 4 mA

Reference voltage on prog. connector	V _{ref} TC	5.114 V ± 15 mV (R _o = 2 Ohm, max. 4 mA) 20 ppm
+12 V output on prog. Connector	V _o I _{max} R _o	12 V ± 0.2 V 0.2 A 3 Ohm
Relay Outputs ACF DCF	AC - Fail DC - Fail ¹⁾	both NO and NC contact both NO and NC contact ¹⁾ output voltage ± 5% beyond set point

Status outputs CC - status LIM- status OT - status PSOL - status ACF - status DCF - status	CC - operation CV or CC limit Over Temperature Power Sink Overload AC - Fail DC - Fail ²⁾	5 V = logic 1 (R _o = 500 Ohm) 5 V = logic 1 (R _o = 500 Ohm) 5 V = logic 1 (R _o = 500 Ohm) 5 V = logic 1 (R _o = 500 Ohm) 5 V = logic 1 (R _o = 500 Ohm) 5 V = logic 1 (R _o = 500 Ohm)	²⁾ output voltage ± 5% beyond set point
Remote ShutDown	with + 5V, 1 mA or relay contact		
Interlock	contact at rear panel, see photo of rear panel on page 1-6		
Indicators (front panel)	Voltage meter, Ampere meter, AC-Fail, DC-Fail, Over Temperature, Power Sink Overload, Remote-ShutDown, Remote-CV, Remote-CC, Output On, CV-limit, CC-limit, CV- and CC- mode		
Controls (front panel)	Mains on/off switch, CV-and CC-potmeter, CV- and CC-limit-potmeter, Display-Settings button, Display-Limits button, Remote/Local button, Output On/Off button, Front panel Lock button.		

Programming speed <i>Standard Version</i>	SM 15-100	SM 35-45	SM 52-30	SM 52-AR-60	SM 70-22	SM 120-13	SM 300-5	SM 400-AR-8
Rise time (10 - 90%) output voltage step time, (100 % load) time, (10 % load)	0 → 15 V 6.1 ms 2.1 ms	0 → 35 V 15.4 ms 5.1 ms	0 → 52 V 7.3 ms 2.4 ms	0 → 26 V 8.5 ms 2.8 ms	0 → 70 V 13.2 ms 4.4 ms	0 → 120 V 3.4 ms 2 ms	0 → 300 V 9 ms 3.9 ms	0 → 200 V 3.7 ms 2.6 ms
output voltage step time, (100 % load) time, (10 % load)	- - -	- - -	- - -	0 → 52 V 34.2 ms 11 ms	- - -	- - -	- - -	0 → 400 V 15 ms 5 ms
Fall time (90 - 10%) output voltage step time, (100 % load) time, (10 % load)	15 → 0 V 6.1 ms 61 ms	35 → 0 V 14.7 ms 147 ms	52 → 0 V 7 ms 70 ms	26 → 0 V 8.2 ms 82 ms	70 → 0 V 12.9 ms 129 ms	120 → 0 V 3.3 ms 33 ms	300 → 0 V 9 ms 90 ms	200 → 0 V 3.5 ms 35 ms
output voltage step time, (100 % load) time, (10 % load)	- - -	- - -	- - -	52 → 0 V 33 ms 330 ms	- - -	- - -	- - -	400 → 0 V 14.2 ms 142 ms
Programming speed <i>High Speed Version</i>	SM 15-100 <i>Option P210</i>	SM 35-45 <i>Option P211</i>	SM 52-30 <i>Option P212</i>	SM 52-AR-60 <i>Option P213</i>	SM 70-22 <i>Option P214</i>	SM 120-13 <i>Option P215</i>	SM 300-5 <i>Option P216</i>	SM 400-AR-8 <i>Option P217</i>
Rise time (10 - 90%) output voltage step time, (100 % load) time, (10 % load)	0 → 15 V 0.20 ms 0.11 ms	0 → 35 V 0.27 ms 0.14 ms	0 → 52 V 0.31 ms 0.23 ms	0 → 26 V 0.44 ms 0.43 ms	0 → 70 V 0.47 ms 0.30 ms	0 → 120 V 0.46 ms 0.27 ms	0 → 300 V 1.0 ms 0.51 ms	0 → 200 V 0.35 ms 0.33 ms
output voltage step time, (100 % load) time, (10 % load)	- - -	- - -	- - -	0 → 52 V 0.53 ms 0.34 ms	- - -	- - -	- - -	0 → 400 V 0.98 ms 0.59 ms
Fall time (90 - 10%) output voltage step time, (100 % load) time, (10 % load)	15 → 0 V 0.21 ms 1.6 ms	35 → 0 V 0.33 ms 3.5 ms	52 → 0 V 0.38 ms 3.9 ms	26 → 0 V 0.27 ms 3.2 ms	70 → 0 V 0.78 ms 8.3 ms	120 → 0 V 0.51 ms 4.5 ms	300 → 0 V 1.40 ms 13 ms	200 → 0 V 0.35 ms 3.8 ms
output voltage step time, (100 % load) time, (10 % load)	- - -	- - -	- - -	52 → 0 V 1.0 ms 9.7 ms	- - -	- - -	- - -	400 → 0 V 1.7 ms 18 ms
Ripple @full load (rms/pp) @full load (rms/pp)	15 / 50 mV	50/115 mV	55 /135 mV	26 V / 60 A 30 / 105 mV 52 V / 30 A 25 / 90 mV	45/150 mV	20 / 80 mV	25 /115 mV	200 V 85 / 355 mV 400 V 60 / 245 mV
Output capacitance	390 µF	190 µF	91 µF	195 µF	113 µF	21 µF	10 µF	7 µF

Notes: All specifications regarding programming speed are typical and measured on a resistive load.

	SM 15-100	SM 35-45	SM 52-30	SM 52-AR-60	SM 70-22	SM 120-13	SM 300-5	SM 400-AR-8
Recovery time recovery within di/dt of load step output voltage time, @ 50 - 100% load step max. deviation @ 230 V AC input voltage	50 mV 1.5 A/µs 14 V 100 µs 200 mV	50 mV 0.8 A/µs 30 V 100 µs 150 mV	100 mV 0.5 A/µs 48 V 100 µs 250 mV	26 V / 52 V 60 mV 1.0 / 0.5 A/µs 24 / 48 V 100 / 100 µs 200 / 100 mV	100 mV 0.4 A/µs 65 V 100 µs 200 mV	0.7 V 0.2 A/µs 110 V 100 µs 2.2 V	1.0 V 0.1 A/µs 280 V 100 µs 1.5 V	200 V / 400 V 1.0 / 0.5 V 0.2 / 0.1 A/µs 185 / 370 V 100 / 100 µs 2.5 / 1.5 V
Output impedance CV, 0-1 kHz CV, 1-100 kHz	< 1.3 mΩ < 25 mΩ	< 1.7 mΩ < 30 mΩ	< 3.5 mΩ < 30 mΩ	< 3.3 mΩ < 40 mΩ	< 7.5 mΩ < 30 mΩ	< 63 mΩ < 0.6 Ω	< 125 mΩ < 1 Ω	< 83 mΩ < 1.3 Ω
Pulsating load max. tolerable AC component of load current f > 1 kHz f < 1 kHz	15 Arms 100 Apeak	15 Arms 45 Apeak	13 Arms 30 Apeak	20 Arms 30 / 60 Apeak	13 Arms 22 Apeak	2.5 Arms 13 Apeak	1.2 Arms 5 Apeak	0.8 Arms 8 / 4 Apeak

Insulation input / output creepage / clearance	3750 Vrms (1 min.) 8 mm
input / case output / case	2500 Vrms 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 Generic Immunity	EN 61000-6-3 , residential, light industrial environment (EN 55022 B) 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 $V_{out} = 100\%$, $I_{out} = 100\%$ $V_{out} = 85\%$, $I_{out} = 100\%$ $V_{out} = 100\%$, $I_{out} = 50\%$ @ 230 V AC input	16 ms 20 ms 36 ms (time till DC-fail = 1)
Turn on delay after mains switch on	480 ms @ 230 V AC, 700 ms @ 115 V AC
Inrush current	27 A@115 V AC, 22 A@230 V AC

Series operation max. total voltage Master / Slave operation	600 V yes							
Parallel operation max. total current Master / Slave operation	no limit max. 4 units (including master)							
Remote sensing max. volt. drop per load lead	2 V							
Limits Voltage adjust range Current adjust range	0 - 102% 0 - 102%							
Potentiometers & Encoders front panel control with knobs resolution screwdriver adjustment digital encoders	standard 0.03 % Option P001 (at front panel) Option P220							
	SM 15-100	SM 35-45	SM 52-30	SM 52-AR-60	SM 70-22	SM 120-13	SM 300-5	SM 400-AR-8
Meters scale voltage scale current accuracy read output read limit setting (d = digit)	3.5 digit 0 - 15.00 V 0 - 100.0 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 35.0 V 0 - 45.0 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 52.0 V 0 - 30.0 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 52.0 V 0 - 60.0 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 70.0 V 0 - 22.0 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 120.0 V 0 - 13.00 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 300 V 0 - 5.00 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 400 V 0 - 8.00 A 0.5% + 2 d 2% + 2 d

Mounting	Stacking of units allowed, air flow is from left to right.
Input Connector	IEC320/C20, EN 60320/C20
Output Terminals	M8 bolts
Programming connector	15 pole D-connector at rear panel (FEMALE)
Cooling audio noise level airflow	Low noise blower, fan speed adapts to temperature of internal heatsink. ca.45 dBA at full load, 25 °C ambient temperature, 1 m distance ca. 50 dBA at full load, 50 °C ambient temperature, 1 m distance from left to right
Enclosure degree of protection	IP20
Dimensions behind front panel: h x w x d front panel: h x w	89 x 442 x 365 mm (feet removed) 89 x 483 mm (19", 2 U)
Weight	9.9 kg

Digital Encoders

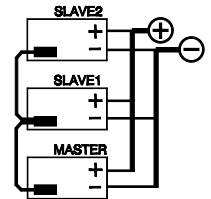
- CV and CC encoders with a very long life time and intelligent functions (e.g. Keylock).

OPTION P220**Screwdriver adjustment standard potentiometers**

- CV and CC knobs are moved backwards to avoid accidental adjusting.

OPTION P001**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).
- Easy to connect in Master / Slave mode, using standard UTP-cables (RJ45).
Standard on all SM1500 units, no special option required.

**Battery Charging**

- 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 52-30	SM 52-AR-60	SM 120-13	SM 300-5	SM 400-AR-8
Option	P197	P198	P199	P200	P201

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

Increased max. output voltage/current**OPTION P069**

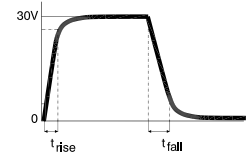
- The maximum output voltage or current can be increased by approximately 10%. Normally this results in a derating of the maximum ambient temperature or other parameters.
- Always add increased value for voltage or current in ordercode, for example **SM35-45 P069 output 38 V**.
For exact details consult 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 .

High Speed Programming

- The speed is **10 - 20 times higher** because of the smaller output capacitors.
- Relatively low current overshoots (if any) in case of sudden voltage variations caused by the load, this is of great advantage for laser diode applications.
- Applications:*
- Laser diode** power supply, continuous or pulsed.
- Test systems requiring a fast settling time to improve throughput of factory.
- A constant current source with a low parallel capacitance: plasma, load sensitive to current overshoots, etc.
- A constant current source on a load with **fast voltage variations**.
- Ordering information:*

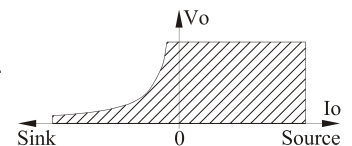


	SM 15-100	SM 35-45	SM 52-30	SM 52-AR-60	SM 70-22	SM 120-13	SM 300-5	SM 400-AR-8
Option	P210	P211	P212	P213	P214	P215	P216	P217

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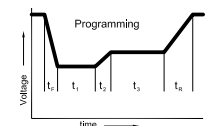
Power Sink for 2 quadrant operation

- Can absorb **200 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:*

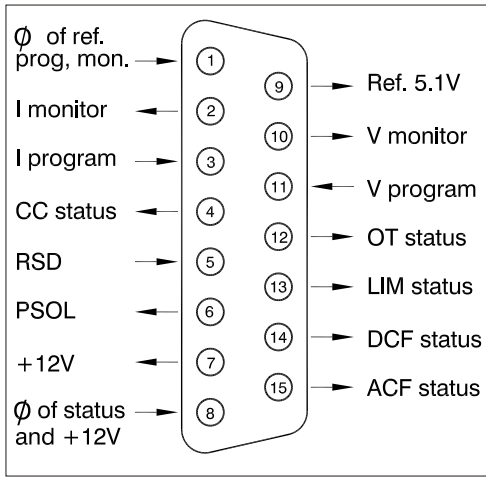


	SM 15-100	SM 35-45	SM 52-30	SM 52-AR-60	SM 70-22
Option	P202	P203	P204	P205	P206

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

Built-in ISO AMP CARD for isolated analog programming**OPTION P218****Built-in RS232 Power Supply Controller****OPTION P183****Built-in IEEE488 Power Supply Controller****OPTION P184****Built-in Ethernet Power Supply Controller****OPTION P177****Built-in Profibus Power Supply Controller****OPTION P273****Built-in CANopen Power Supply Controller****OPTION P274**

Note: there is only room for one of the interfaces in a unit (P177, P183, P184, P218, P273, P274)



Connections programming connector

CV = Constant Voltage
 CC = Constant Current

Specifications measured at
 $t_{amb} = 25 \pm 5^\circ C$ and $V_{in} = 230 V AC$,
 50 Hz, unless otherwise noted.

The information in this document is
 subject to change without notice

