

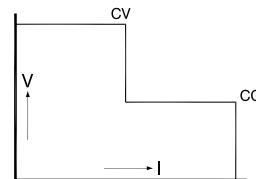
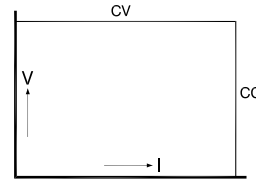


**SM1500 - series**  
**1500 watts DC POWER SUPPLIES**

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

**Autoranging**

<b>SM 52-AR-60</b>	<b>0 - 26 V</b>	<b>0 - 60 A</b>
	<b>0 - 52 V</b>	<b>0 - 30 A</b>
<b>SM 400-AR-8</b>	<b>0 - 200 V</b>	<b>0 - 8 A</b>
	<b>0 - 400 V</b>	<b>0 - 4 A</b>



- Efficiency up to 91 %.
- Weight only 9.9 kg
- Wide input voltage range: 90 - 265 VAC, 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, IEEE488** or **RS232** programming with optional internal interface cards
- Very low HF-emission, OK for **light** industrial environment, 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
- Voltage and current control with 10 turn potentiometers, resolution 0.03 %
- Low noise blower, fan speed adapts to temperature
- 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
<b>Output</b>								
voltage	0 - 15 V	0 - 35 V	0 - 52 V	0 - 52 V	0 - 70 V	0 - 120 V	0 - 300 V	0 - 400 V
current	0 - 100 A	0 - 45 A	0 - 30 A	0 - 60 A	0 - 22 A	0 - 13 A	0 - 5 A	0 - 8 A
AUTORANGING (2 ranges) max. output current / voltage	no -	no -	no -	yes 60 A / 0-26 V 30 A / 26-52 V	no -	no -	no -	yes 8 A / 0-200 V 4 A / 200-400V
<b>Input</b>								
<b>AC</b> single phase, 48 - 62 Hz	90 - 265 V	90 - 265 V	90 - 265 V	90 - 265 V	90 - 265 V	90 - 265 V	90 - 265 V	90 - 265 V
<i>Power Derating vs input:</i>								
90 V : P <sub>out max</sub> (W), I <sub>in</sub> (A)	1170,16	1185, 16	1200,16	1200,16	1200,16	1200,16	1200,16	1200,16
100 V : P <sub>out max</sub> (W), I <sub>in</sub> (A)	1317, 16	1334, 16	1350,16	1350,16	1350,16	1350,16	1350,16	1350,16
110 V : P <sub>out max</sub> (W), I <sub>in</sub> (A)	1492, 16	1498, 16	1505,16	1505,16	1505,16	1505,16	1500,16	1505,16
<b>230 V : P<sub>out max</sub> (W), I<sub>in</sub> (A)</b>	1500, 7.5	1575, 7.7	1560, 7.7	1560,7.7	1540, 7.6	1560, 7.7	1500, 7.4	1600, 7.8
power factor, 100%, 50% load	0.99, 0.98	0.99, 0.98	0.99, 0.98	0.99, 0.98	0.99, 0.98	0.99, 0.98	0.99, 0.98	0.99, 0.98
internal fuses	25 AT	25 AT	25 AT	25 AT	25 AT	25 AT	25 AT	25 AT
standby input power (Vo=Io=0)	12 W	12 W	12 W	12 W	12 W	12 W	12 W	12 W
standby input power (Vo=V <sub>max</sub> )	22 W	22 W	22 W	22 W	22 W	22 W	22 W	25 W
				26 V / 52 V				200 V / 400 V
<b>Efficiency</b>								
AC 230 V input, full load	87 %	90 %	90 %	89 / 90 %	90 %	90 %	91 %	90 / 91%
AC 115 V input, max. load	83 %	86 %	86 %	84%	86 %	86 %	86 %	86%
<b>Regulation</b>								
Load 0 - 100% <b>CV</b>	0.5 mV	1 mV	2 mV	2 mV	2.5 mV	4 mV	10 mV	12 mV
Line 120 - 265 V AC <b>CV</b> (measured on sense block)	0.2 mV	0.5 mV	0.7 mV	0.7 mV	1 mV	2 mV	3 mV	4 mV
Load 0 - 100% <b>CC</b>	5 mA	3 mA	1.5 mA	2 mA	1 mA	0.6 mA	0.5 mA	0.5 mA
Line 120 - 265 V AC <b>CC</b> (internal voltage sense)	1 mA	0.5 mA	0.5 mA	1 mA	0.25 mA	0.2 mA	0.1 mA	0.2 mA
<b>Ripple + noise</b>								
rms (BW=300 kHz) <b>CV</b>	2 mV	1.8 mV	2 mV	2 mV	3 mV	7 mV	7 mV	15 mV
p-p (BW=50 MHz) <b>CV</b>	8 mV	8 mV	15 mV	15 mV	15 mV	30 mV	50 mV	80 mV
rms (BW=300 kHz) <b>CC</b>	15 mA	5 mA	3 mA	10 / 3 mA	3 mA	2 mA	0.5 mA	1.2 / 0.6 mA
p-p (BW=50 MHz) <b>CC</b>	80 mA	15 mA	10 mA	30 / 10 mA	10 mA	6 mA	4 mA	6 / 3 mA
<i>CC-ripple at full load</i>								
<b>Temp. coeff., per °C</b>	<b>CV</b>				35.10 <sup>-6</sup>			
	<b>CC</b>				60.10 <sup>-6</sup>			
<b>Stability</b>								
after 1 hr warm-up during 8 hrs	<b>CV</b>				6.10 <sup>-5</sup>			
	<b>CC</b>				9.10 <sup>-5</sup>			
t <sub>amb</sub> = 25 ± 1 °C, V <sub>in</sub> = 230 VAC (int. voltage sensing for CC-stab.)								

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

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

<b>Status outputs</b> 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 <sup>2)</sup>	5V = logic 1 (Ro = 500 Ohm) 5V = logic 1 (Ro = 500 Ohm) 5V = logic 1 (Ro = 500 Ohm) 5V = logic 1 (Ro = 500 Ohm) 5V = logic 1 (Ro = 500 Ohm) 5V = logic 1 (Ro = 500 Ohm)	<sup>2)</sup> output voltage $\pm$ 5% beyond set point
<b>Remote shutdown</b>	with + 5V, 1 mA or relay contact		
<b>Interlock</b>	contact at rear panel, see photo of rear panel on page 1-6		
<b>Indicators</b> (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		
<b>Controls</b> (front panel)	Mains on/off, CV-and CC-potmeter, CV- and CC-limit-potmeter, Display-Settings button, Display-Limits button, Remote/Local, Output On/Off, Frontpanel Lock		

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

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

<b>Insulation</b> input / output creepage / clearance	3750 Vrms (1 min.) 8 mm
input / case output / case	2500 Vrms 600 V DC
<b>Safety</b>	EN 60950 / EN 61010
<b>EMC Power Supply Standard</b>	<b>EN 61204-3</b> , Emission: residential, <b>light</b> industrial environment (CISPR22-Class <b>B</b> ) Immunity: industrial environment
<b>Generic Emission</b> <b>Generic Immunity</b>	<b>EN61000-6-3</b> , residential, <b>light</b> industrial environment (EN55022 <b>B</b> ) <b>EN61000-6-2</b> , industrial environment
<b>Operating Temperature at full load</b>	- 20 to + 50 °C derate output to 75% at 60 °C
<b>Humidity</b>	max. 95% RH, non condensing, up to 40 °C max. 75% RH, non condensing, up to 50 °C
<b>Storage temperature</b>	- 40 to + 85 °C
<b>Thermal protection</b>	Output shuts down in case of insufficient cooling
<b>MTBF</b>	500 000 hrs

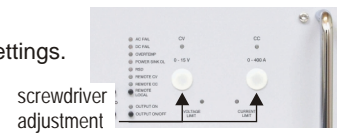
<b>Hold-Up time</b> Vout = 100%, Iout = 100% Vout = 85%, Iout = 100% Vout = 100%, Iout = 50% @ 230 VAC input	16 ms 20 ms 36 ms (time till DC-fail = 1)
<b>Turn on delay</b> after mains switch on	480 ms @ 230 Vac, 700ms @ 115Vac
<b>Inrush current</b>	27A@115Vac, 22A@230Vac

<b>Series operation</b> max. total voltage Master / Slave operation	600 V yes
<b>Parallel operation</b> max. total current Master / Slave operation	no limit max. 4 units (including Master)
<b>Remote sensing</b> max. volt. drop per load lead	2 V
<b>Limits Voltage</b> adjust range <b>Current</b> adjust range	0 - 102% 0 - 102%
<b>Potentiometers</b> front panel control with knobs resolution  screwdriver adjustment	standard 0.03 %  option P001 (at front panel)
	<b>SM 15-100</b> <b>SM 35-45</b> <b>SM 52-30</b> <b>SM 52-AR-60</b> <b>SM 70-22</b> <b>SM 120-13</b> <b>SM 300-5</b> <b>SM 400-AR-8</b>
<b>Meters</b> 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 - 35.0V 0 - 45.0 A 0.5% + 2 d 2% + 2 d
	3.5 digit 0 - 52.0V 0 - 30.0 A 0.5% + 2 d 2% + 2 d
	3.5 digit 0 - 52.0V 0 - 60.0 A 0.5% + 2 d 2% + 2 d
	3.5 digit 0 - 70.0V 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

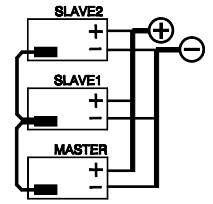
<b>Mounting</b>	Stacking of units allowed, air flow is from left to right.
<b>Input Connector</b>	IEC320/C20, EN60320/C20
<b>Output Terminals</b>	M8 bolts
<b>Programming connector</b>	15 pole D-connector at rear panel (FEMALE)
<b>Cooling</b> audio noise level  airflow	Low noise blower, fan speed adapts 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
<b>Enclosure</b> degree of protection	IP20
<b>Dimensions</b> 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)
<b>Weight</b>	9.9 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 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 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:*



	SM52-30	SM52-AR-60	SM120-13	SM300-5	SM400-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**

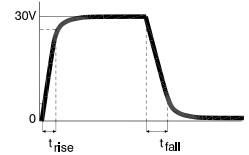
- The maximum output voltage or current can be increased by approximately 10%. Normally this results in a derating of the maximum ambient temperature or other parameters.
- Always add increased value for voltage or current in ordercode, for example **SM35-45 P069 output 38V**.  
*For exact details consult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

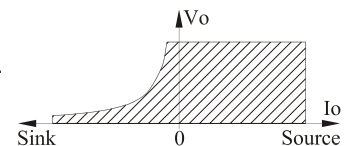


	SM15-100	SM35-45	SM52-30	SM52-AR-60	SM70-22	SM120-13	SM300-5	SM400-AR-8
option	P210	P211	P212	P213	P214	P215	P216	P217

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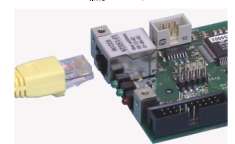
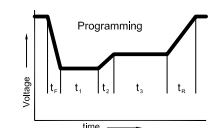
**Power Sink for 2 quadrant operation**

- Can absorb **200W 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:*



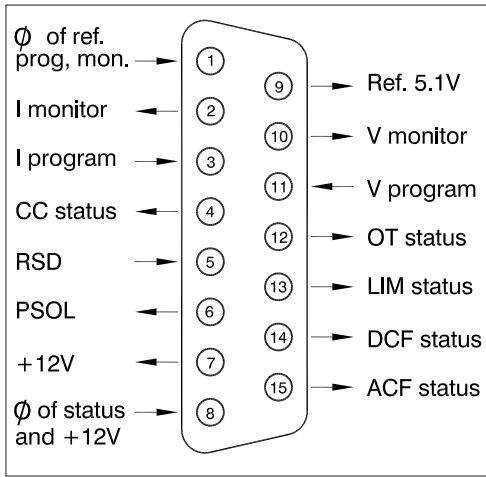
	SM15-100	SM35-45	SM52-30	SM52-AR-60	SM70-22
option	P202	P203	P204	P205	P206

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

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

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





connections programming connector

CV = Constant Voltage  
 CC = Constant Current

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

The information in this document is subject to change without notice

