

P.O. Box 27
4300 AA Zierikzee
The Netherlands

Tel. +31 111 413656
Fax. +31 111 416919
www.deltapowersupplies.com

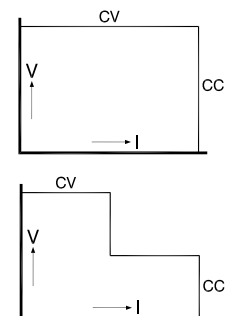


DELTA ELEKTRONIKA B.V.



SM 800 - Series 800 W DC POWER SUPPLY

Models	Voltage range	Current range
SM 7.5-80	0 - 7.5 V	0 - 80 A
SM 18-50	0 - 18 V	0 - 50 A
SM 70-AR-24 Autoranging output	0 - 35 V 0 - 70 V	0 - 24 A 0 - 12 A
SM 400-AR-4 Autoranging output	0 - 200 V 0 - 400 V	0 - 4 A 0 - 2 A



Features

- Designed for long life at full power
- Excellent dynamic response to load changes
- Protected against all overload and short circuit conditions
- EMC surpasses CE requirements: low emission & high immunity
- Low audible noise: fans are temperature controlled
- Available options: High Speed Programming, Interfaces, Extra Isolation, Sequencer, Digital Encoders, Power Sink etc.

Functionalities

- Master/Slave parallel and series operation with voltage and current sharing
- Stacking is allowed, space between units is not required
- High power system configuration from multiple units
- 19" rack mounting or for laboratory use (feet included)
- Remote sensing
- Interlock

	SM 7.5-80	SM 18-50	SM 70-AR-24	SM 400-AR-4
Output voltage current AUTORANGING (2 ranges) max. output current / voltage	0 - 7.5 V 0 - 80 A no -	0 - 18 V 0 - 50 A no -	0 - 70 V 0 - 24 A yes 24 A / 0-35 V 12 A / 35-70 V	0 - 400 V 0 - 4 A yes 4 A / 0-200 V 2 A / 200-400 V
Input AC single phase, 48 - 62 Hz 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 580, 8.5 600, 7.6 600, 6.9 600, 3.2 0.99, 0.96 12.5 AT 14 W 18 W	90 - 265 V 725, 10 800, 9.9 800, 8.8 800, 4.1 900, 4.5 0.99, 0.98 12.5 AT 14 W 18 W	90 - 265 V 740, 10 830, 10 840, 9 840, 4.2 0.99, 0.98 12.5 AT 14 W 20 W	90 - 265 V 750, 10 800, 9.5 800, 8.5 800, 4 0.99, 0.98 12.5 AT 14 W 26 W
			35 V / 70 V	200 V / 400 V
Efficiency AC 230 V input, full load AC 115 V input, max. load	82 % 80 %	87 % 83 %	89 % 85 %	89 % 86 %
Regulation				
Load 0 - 100% CV Line 120 - 265 V AC CV (measured on sense block)	0.2 mV 0.2 mV	0.5 mV 0.2 mV	2 mV 0.5 mV	10 mV 2 mV
Load 0 - 100% CC Line 120 - 265 V AC CC (internal voltage sense)	4 mA 1 mA	3 mA 1 mA	1.5 mA 1 mA	0.5 mA 0.2 mA
Ripple + noise rms (BW=300 kHz) CV p-p (BW=20 MHz) CV rms (BW=300 kHz) CC p-p (BW=20 MHz) CC	2.5 mV 10 mV 25 mA 120 mA	2 mV 8 mV 5 mA 25 mA	3 mV 15 mV 3 / 1 mA 15 / 5 mA	15 mV 80 mV 0.8 / 0.5 mA 3 / 1.5 mA
Front panel connection				
Load Regulation: CV Load 0 - 100% Ripple + noise CV rms (BW=300 kHz) CV p-p (BW=20 MHz) CV	- - -	15 mV 3 mV 18 mV	40 mV 4 mV 20 mV	15 mV 18 mV 150 mV
Temp. coeff., per °C CV CC			35.10 ⁻⁶ 60.10 ⁻⁶	
Stability after 1 hr warm-up during 8 hrs CV CC $t_{amb} = 25 \pm 1\ ^\circ\text{C}$, $V_{in} = 230\ \text{V AC}$ (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 $\pm 0.2\%$ - 0.1 ... +1.3 mV (on 5V) 10 $\mu\text{V} / ^\circ\text{C}$ > 1 MOhm	0 - 5 V $\pm 0.5\%$ 0 ... +2.2 mV (on 5V) 50 $\mu\text{V} / ^\circ\text{C}$ > 1 MOhm
Monitoring output output range accuracy offset temp. coeff. offset output impedance	0 - 5 V $\pm 0.2\%$ - 1... 0 mV (on 5V) 3 $\mu\text{V} / ^\circ\text{C}$ 2 Ohm / max. 4 mA	0 - 5 V $\pm 0.5\%$ - 1.1... 0 mV (on 5V) 60 $\mu\text{V} / ^\circ\text{C}$ 2 Ohm / max. 4 mA

Reference voltage on prog. connector V_{ref} TC	5.114 V $\pm 15\ \text{mV}$ ($R_o = 2\ \text{Ohm}$, max. 4 mA) 20 ppm
+12 V output on prog. Connector V_o I_{max} R_o	12 V $\pm 0.2\ \text{V}$ 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 $\pm 5\%$ 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 ($R_o = 500 \text{ Ohm}$) 5 V = logic 1 ($R_o = 500 \text{ Ohm}$) 5 V = logic 1 ($R_o = 500 \text{ Ohm}$) 5 V = logic 1 ($R_o = 500 \text{ Ohm}$) 5 V = logic 1 ($R_o = 500 \text{ Ohm}$) 5 V = logic 1 ($R_o = 500 \text{ Ohm}$)	²⁾ output voltage $\pm 5\%$ 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 buttons.		

Programming speed	SM 7.5-80	SM 18-50	SM 70-AR-24	SM 400-AR-4
Rise time (10 - 90%) output voltage step time, (100 % load) time, (10 % load)	0 $\rightarrow$ 7.5 V 6.5 ms 2.5 ms	0 $\rightarrow$ 16 V 12 ms 5 ms	0 $\rightarrow$ 35 V 6 ms 2.5 ms	0 $\rightarrow$ 200 V 4 ms 2 ms
output voltage step time, (100 % load) time, (10 % load)	- - -	- - -	0 $\rightarrow$ 70 V 10 ms 7 ms	0 $\rightarrow$ 400 V 8 ms 5 ms
Fall time (90 - 10%) output voltage step time, (100 % load) time, (10 % load)	7.5 $\rightarrow$ 0 V 6.5 ms 62 ms	16 $\rightarrow$ 0 V 12 ms 120 ms	35 $\rightarrow$ 0 V 6 ms 60 ms	200 $\rightarrow$ 0 V 4 ms 42 ms
output voltage step time, (100 % load) time, (10 % load)	- - -	- - -	70 $\rightarrow$ 0 V 25 ms 250 ms	400 $\rightarrow$ 0 V 15 ms 155 ms
Programming speed	SM 7.5-80	SM 18-50	SM 70-AR-24	SM 400-AR-4
Rise time (10 - 90%) output voltage step time, (100 % load) time, (10 % load)	0 $\rightarrow$ 7.5 V 0.2 ms 0.2 ms	0 $\rightarrow$ 16 V 0.22 ms 0.26 ms	0 $\rightarrow$ 35 V 0.24 ms 0.24 ms	0 $\rightarrow$ 200 V 0.4 ms 0.3 ms
output voltage step time, (100 % load) time, (10 % load)	- - -	- - -	0 $\rightarrow$ 70 V 0.24 ms 0.24 ms	0 $\rightarrow$ 400 V 0.82 ms 0.55 ms
Fall time (90 - 10%) output voltage step time, (100 % load) time, (10 % load)	7.5 $\rightarrow$ 0 V 0.2 ms 1 ms	16 $\rightarrow$ 0 V 0.24 ms 1.95 ms	35 $\rightarrow$ 0 V 0.27 ms 3 ms	200 $\rightarrow$ 0 V 0.42 ms 4.6 ms
output voltage step time, (100 % load) time, (10 % load)	- - -	- - -	70 $\rightarrow$ 0 V 0.85 ms 9.5 ms	400 $\rightarrow$ 0 V 1.7 ms 20 ms
Ripple @full load (rms/pp) @full load (rms/pp)	20 / 80 mV	40 / 120 mV	35 V / 24 A 25 / 90 mV 70 V / 12 A 30 / 110 mV	200 V / 4 A 35 / 200 mV 400 V / 2 A 30 / 160 mV
Output capacitance	310 μF	200 μF	80 μF	4 μF

	SM 7.5-80	SM 18-50	SM 70-AR-24	SM 400-AR-4
Recovery time recovery within di/dt of load step output voltage time, @ 50 - 100% load step max. deviation	50 mV 1.25 A/ μs 7 V 100 μs 160 mV	60 mV 0.9 A/ μs 15 V 100 μs 150 mV	35 V / 70 V 75 mV 0.4 / 0.2 A/ μs 30 / 65 V 100 μs 250 / 200 mV	200 V / 400 V 1 / 0.5 V 0.1 / 0.05 A/ μs 185 / 370 V 100 μs 2 / 1.5 V
Output impedance CV, 0-1 kHz CV, 1-100 kHz	< 1 m Ω < 30 m Ω	< 2 m Ω < 30 m Ω	< 7 m Ω < 35 m Ω	< 0.18 Ω < 2 Ω
Pulsating load max. tolerable AC component of load current f > 1 kHz f < 1 kHz	15 Arms 80 Apeak	15 Arms 50 Apeak	10 Arms 12 / 24 Apeak	0.4 Arms 2 / 4 Apeak

Insulation input / output creepage / clearance	3750 Vrms (1 min.) 8 mm
	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%, P _{out} ≤ 840 W V _{out} = 85%, I _{out} = 100% V _{out} = 100%, I _{out} = 50%	16 ms 20 ms 36 ms
Turn on delay after mains switch on	600 ms @ 230 V AC, 900 ms @ 115 V AC
Inrush current	24 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 P236			
	SM 7.5-80	SM 18-50	SM 70-AR-24	SM 400-AR-4
Meters scale voltage scale current accuracy read output read limit setting (d = digit)	3.5 digit 0 - 7.50 V 0 - 80.0 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 18.00 V 0 - 50.0 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 70.0 V 0 - 24.0 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 400 V 0 - 4.00 A 0.5% + 2 d 2% + 2 d

Mounting	Stacking of units allowed, air flow is from rear to the sides.
Input Connector	IEC320/C14, EN 60320/C14
Output Terminals	M5 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 rear to sides
Enclosure degree of protection	IP20
Dimensions behind front panel: h x w x d front panel: h x w	86 x 221 x 406 mm (feet removed) 88.1 x 222 mm (1/2 19", 2 U)
Weight	5.4 kg

Typical Applications

- Accurate current sources
- Electronic circuit development
- Component device testing
- ATE in industrial production lines
- Automotive battery simulation
- Controlled battery (dis)charging
- Lasers
- Driving PWM-controlled DC-motors
- Medical research equipment
- Aerospace and military equipment

Available Options



Increased Output Power

The conservatively rated unit allows to deliver extra output with the same reliability.

At some derating, either the maximum output voltage or the maximum output current can be increased by about 10%.

- Order Code - P069

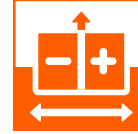


High speed programming

A 10 to 20 times higher programming speed (down to 0.2 ms rise time at full load)

and lower output capacitance. Excellent for laser applications, test systems or as current source with low parallel capacitance as used in plasma chambers.

- Order Codes :
SM 7.5-80 P250 - SM 70-AR-24 P252
SM 18-50 P251 - SM 400-AR-4 P253



Two-Quadrant Output: Power sink

Two quadrant operations maintains the output voltage constant regardless the

output power is positive or negative. Ideal for PWM-speed controlled DC-motors and ATE systems.

- Order Codes :
SM 7.5-80 P245 - SM 70-AR-24 P247
SM 18-50 P246 - SM 400-AR-4 P248



Digital Voltage and current setting

Reliable, long life digital encoders are implemented at the front panel.

Includes total front panel lock (also for CV/CC-knobs) and a coarse or fine pitch adjustment depending on the turning speed.

- Order Code - P236



High Voltage Isolation

A higher output isolation allows series operation up to 1000V

- Order Code - P089



Secured Voltage and Current Setting

For a maximum security, the CV/CC settings can be adjusted with a screwdriver only and are protected with a plastic cap from accidental adjusting.

- Order Code - P001



Sequencer

Arbitrary Waveform generator or standalone automation.

The sequencer is integrated in the Ethernet controller.

- Order Code - P256



Front Power Output

Blind posts at the front panel instead of at the rear panel.

- Order Codes :
SM 7.5-80 n.a. - SM 70-AR-24 P258
SM 18-50 P257 - SM 400-AR-4 P259



19" Rack Mounting Adapter

The 19" mounting adapters makes it possible to position one or two units side by side in a 19" rack.

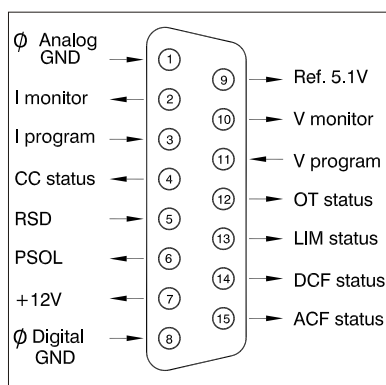
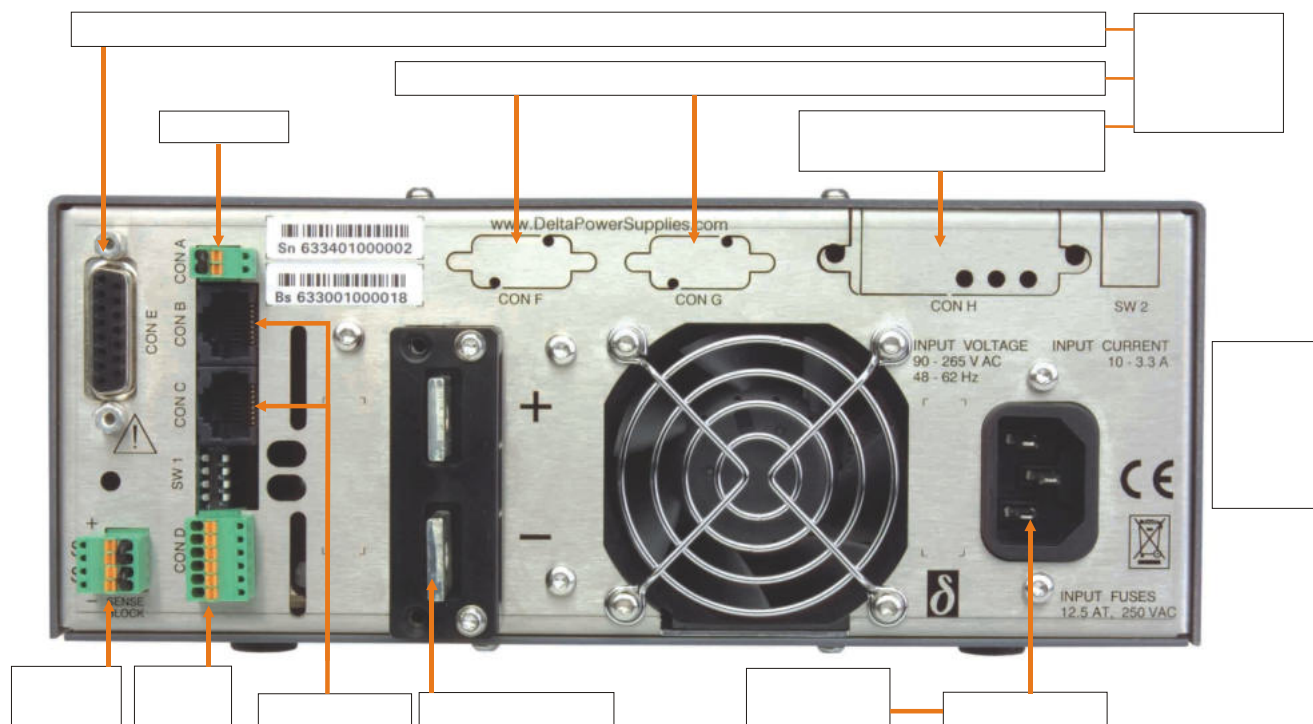
- Order Code RA19 - 2SM800



Software control and interfaces

Factory installed programming interfaces:

- ISO AMP Card - isolated analog - P249
- RS232 controller - P254
- IEEE488 controller - P255
- Ethernet controller (incl. sequencer) - P256
- PROFIBUS controller - P271
- CANBUS controller - P272



Connections programming connector

CV = Constant Voltage
CC = Constant Current

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

The information in this document is
subject to change without notice



19" Rack Adapter RA19-2 SM800



Front panel connection

SM18-50 Opt. 257
SM70-AR-24 Opt. 258
SM400-AR-4 Opt. 259



19" Rack Adapter RA19-1 SM800