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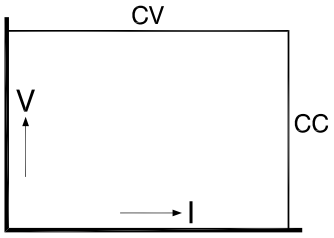
SM 3000 - series

3000 watts DC POWER SUPPLIES

Three phase input

SM 15-200 D	**0 - 15 V**	**0 - 200 A**
SM 30-100 D	**0 - 30 V**	**0 - 100 A**
SM 45-70 D	**0 - 45 V**	**0 - 70 A**
SM 70-45 D	**0 - 70 V**	**0 - 45 A**
SM 120-25 D	**0 - 120 V**	**0 - 25 A**
SM 300-10 D	**0 - 300 V**	**0 - 10 A**



- Efficiency 91 %.
- Weight only 15 kg
- 3 phase 380 V, 400 V, 415 V AC input (48 - 62 Hz, line to line voltage)
- 200 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 output ripple and spikes
- Very stable output voltage or current (2.10^{-5} - 10^{-4})
- No inrush current during switch on
- Master / Slave parallel and series operation with equal current and voltage sharing
- Can be used as a building block to form a high power unit
- Input / output insulation 3750 Vrms
- Designed for long life at full power
- Protected against all overload and short circuit conditions
- Modular built-up, service friendly
- Voltage and current control with 10 turn potentiometers, resolution 0.03 %
- Low noise blower, fan speed adapts to temperature

		SM 15-200 D	SM 30-100 D	SM 45-70 D	SM 70-45 D	SM 120-25 D	SM 300-10 D
Output							
voltage		0-15 V	0-30 V	0-45 V	0-70 V	0-120 V	0-300 V
current		0-200 A	0-100 A	0-70 A	0-45 A	0-25 A	0-10 A
Input							
AC 3 phase, 48 - 62 Hz for use at 380 V, 400 V, 415 V nominal line - line voltage		342-457 V	342-457 V	342-457 V	342-457 V	342-457 V	342-457 V
current (400 V AC / 3 phase)		5.7 Arms	5.5 Arms	5.8 Arms	5.8 Arms	5.5 Arms	5.5 Arms
power factor (380 V / 3 phase)							
100% load		0.88	0.88	0.88	0.88	0.88	0.88
50% load		0.78	0.78	0.78	0.78	0.78	0.78
DC		contact factory	contact factory	contact factory	contact factory	contact factory	contact factory
fuses		16 AT	16 AT	16 AT	16 AT	16 AT	16 AT
standby input power (V_o=I_o=0)		25 W	25 W	25 W	25 W	25 W	25 W
standby input power (V_o=V_{max})		50 W	50 W	50 W	50 W	50 W	50 W
Efficiency							
AC 3 phase input, full load		87 %	90 %	89 %	90 %	90 %	90 %
Regulation							
Load 0 - 100%	**CV**	5 mV	5 mV	5 mV	10 mV	10 mV	15 mV
Line 342 - 457 V AC	**CV**	5 mV	5 mV	5 mV	5 mV	10 mV	10 mV
Load 0 - 100%	**CC**	50 mA	25 mA	15 mA	10 mA	10 mA	3 mA
Line 342 - 457 V AC	**CC**	50 mA	25 mA	15 mA	10 mA	10 mA	3 mA
Ripple + noise, rms / p-p	**CV**	2 / 12 mV	1.6 / 8 mV	3.5 / 17 mV	2 / 12 mV	5 / 25 mV	10 / 50 mV *below 50 V: 25 / 120 mV*
	CC	100 / 250 mA	20 / 60 mA	20 / 60 mA	6 / 25 mA	7 / 25 mA	3 / 10 mA *below 50 V: 60 / 200 mA*
Temp. coeff., per °C	**CV**	typical 10.10^{-6}, max. 35.10^{-6}					
	CC	typical 20.10^{-6}, max. 60.10^{-6}					
Stability							
after 1 hr warm-up							
during 8 hrs	**CV**	typical 2.10^{-5}, max 4.10^{-5}					
	CC	typical 3.10^{-5}, max. 10.10^{-5}					
during 30 hrs	**CV**	typical 2.10^{-5}, max. 5.10^{-5}					
	CC	typical 5.10^{-5}, max. 10.10^{-5}					
t_{amb} = 25 ± 1 °C							

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	±0.5% -5 mV ... +0 mV
temp. coeff. offset	10 µV/°C	150 µV/°C
output impedance	20 Ohm	20 Ohm

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

Programming speed *Standard Version* (resistive load)	**SM 15-200 D**	**SM 30-100 D**	**SM 45-70 D**	**SM 70-45 D**	**SM 120-25 D**	**SM 300-10 D**
Rise time (10 - 90%)						
output voltage step	0 → 15 V	0 → 30 V	0 → 45 V	0 → 70 V	0 → 120 V	0 → 300 V
time, (100 % load)	7 ms	7 ms	7 ms	7 ms	7 ms	7 ms
time, (10 % load)	7 ms	7 ms	7 ms	7 ms	7 ms	7 ms
Fall time (90 - 10%)						
output voltage step	15 → 0 V	30 → 0 V	45 → 0 V	70 → 0 V	120 → 0 V	300 → 0 V
time, (100 % load)	7 ms	7 ms	8 ms	8 ms	7 ms	11 ms
time, (10 % load)	32 ms	58 ms	29 ms	82 ms	39 ms	91 ms
Programming bandwidth						
small signal	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
large signal,(100 % load)	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
large signal,(10 % load)	5 Hz	5 Hz	5 Hz	5 Hz	5 Hz	5 Hz
Programming speed *High Speed Version* (resistive load)	**SM 15-200 D** *option P104*	**SM 30-100 D** *option P031*	**SM 45-70 D** *option P105*	**SM 70-45 D** *option P032*	**SM 120-25 D** *option P106*	**SM 300-10 D** *option P061*
Rise time (10 - 90%)						
output voltage step	0 → 15 V	0 → 30 V	0 → 45 V	0 → 70 V	0 → 120 V	0 → 300 V
time, (100 % load)	0.36 ms	0.33 ms	0.50 ms	0.45 ms	0.34 ms	1.00 ms
time, (10 % load)	0.26 ms	0.32 ms	0.35 ms	0.30 ms	0.32 ms	0.40 ms
Fall time (90 - 10%)						
output voltage step	15 → 0 V	30 → 0 V	45 → 0 V	70 → 0 V	120 → 0 V	300 → 0 V
time, (100 % load)	0.37 ms	0.55 ms	0.60 ms	0.67 ms	0.38 ms	1.20 ms
time, (10 % load)	1.60 ms	3.50 ms	5.00 ms	6.00 ms	3.50 ms	11.0 ms

Recovery time						
recovery within	50 mV	50 mV	100 mV	50 mV	0.5 V	1.5 V
di/dt of load step	2.7 A/µs	1.9 A/µs	1.2 A/µs	2.2 A/µs	1.7 A/µs	0.6 A/µs
time, @ 50 - 100% load step	100 µs	100 µs	100 µs	100 µs	100 µs	100 µs
max. deviation	250 mV	150 mV	200 mV	250 mV	1.5 V	2 V
Noise suppression						
line - line ⇒ output	90 dB	84 dB	85 dB	75 dB	75 dB	90 dB
line - earth ⇒ output	90 dB	90 dB	90 dB	90 dB	90 dB	90 dB
Output impedance						
CV, 0-100 kHz	< 25 mOhm	< 20 mOhm	< 60 mOhm	< 60 mOhm	< 150 mOhm	< 800 mOhm
Pulsating load						
max. tolerable AC component of load current						
f > 1 kHz	15 Arms	15 Arms	10 Arms	10 Arms	5 Arms	2.5 Arms
f < 1 kHz	200 A peak	100 A peak	70 A peak	45 A peak	25 A peak	10 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
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 = 3x 380 V AC 50% load Vin = 3x 380 V AC	 6 ms 15 ms
Turn on delay after mains switch on	 300 ms
Inrush current	5.8 A @ 400 V AC input
Phase loss	The power supply will continue to operate on one phase but at 90% of V_{out}(max) (a SM30-100D adjusted at 27 V will continue to deliver 27 V after phase loss)

	SM 15-200 D	**SM 30-100 D**	**SM 45-70 D**	**SM 70-45 D**	**SM 120-25 D**	**SM 300-10 D**
Series operation max. total voltage Master / Slave operation	 600 V yes	 600 V yes	 600 V yes	 600 V yes	 600 V yes	 600 V yes
Parallel operation max. total current Master / Slave operation	 no limit max. 4 units	 no limit max. 4 units	 no limit max. 4 units	 no limit max. 4 units	 no limit max. 4 units	 no limit max. 4 units
Remote sensing max. voltage drop per load lead	 2 V	 2 V	 2 V	 2 V	 2 V	 2 V
OVP / OVL adjustment range	 0-17 V	 0-35 V	 0-54 V	 0-80 V	 0-140 V	 0-350 V

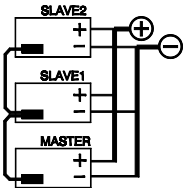
Potentiometers front panel control with knobs resolution screwdriver adjustment at front panel at rear panel	 standard 0.03% option P001 option P002	 standard 0.03% option P001 option P002	 standard 0.03% option P001 option P002	 standard 0.03% option P001 option P002	 standard 0.03% option P001 option P002	 standard 0.03% option P001 option P002
Meters scale voltage scale current accuracy	3.5 digit 0-15.00 V 0-200 A 0.5% + 2 digit	3.5 digit 0-30.0 V 0-100.0 A 0.5% + 2 digit	3.5 digit 0-45.0 V 0-70.0 A 0.5% + 2 digit	3.5 digit 0-70.0 V 0-45.0 A 0.5% + 2 digit	3.5 digit 0-120.0 V 0-25.0 A 0.5% + 2 digit	3.5 digit 0-300 V 0-10.00 A 0.5% + 2 digit

Mounting	Stacking of units allowed, air flow is from left to right.					
Input Terminals input connections	screw terminals for cable 1.5 - 4.0 mm^2 3 phase + earth (no neutral required)					
Output Terminals	M10 bolts	M10 bolts	M10 bolts	M8 bolts	7 mm bind post	6 mm bind post
Programming connector	15 pole D-connector at rear panel (FEMALE)					
Cooling audio noise level	Low noise blower, fan speed adapts to temperature of internal heatsink. ca. 50 dBA at full load and 25 °C ambient temperature ca. 60 dBA at full load and 50 °C ambient temperature					
Enclosure degree of protection	IP20					
Dimensions behind front panel: h x w x d front panel: h x w	128.5 x 443 x 416 mm (with option P099, feet are removed) 128.5 x 483 mm (19", 3 U)					
Weight	15 kg					

Screwdriver adjustment OPTION P001

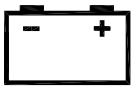
- For a **fixed setting** of the output values, avoids accidental adjusting of the CV and CC settings.
- The potmeters are moved backwards just behind the front panel and plastic caps are inserted to cover the holes, see picture.

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



- 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.
- The SM300-10 needs an **external diode set** (option P023) on the output as protection for the internal diode.

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

Increased max. output voltage/current OPTION P069

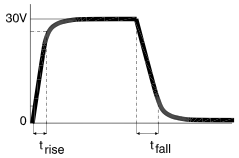
- The maximum output voltage or current can be increased by approximately 10%.
  Normally this results in a derating of the maximum ambient temperature or other parameters.
- Always add increased value for voltage or current in ordercode, for example **SM30-100 P069 output 32 V**

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 15-200 D	SM 30-100 D	SM 45-70 D	SM 70-45 D	SM 120-25 D	SM 300-10 D
optionnr.	P104	P031	P105	P032	P106	P061

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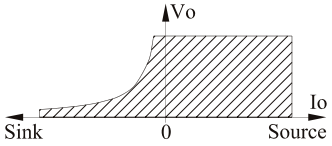
Power Sink for 2 quadrant operation

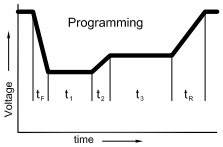


- Can absorb **300 W peak power.**
- Maintains output voltage regardless output power is positive or negative (source & sink).
- Ideal solution for supplying **electric motors** with PWM-speed control.
- Fast down programming at no load conditions.
- *Ordering information:*

	SM 15-200 D	SM 30-100 D	SM 45-70 D	SM 70-45 D
optionnr.	P127	P128	P129	P130

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

Built-in ISO AMP CARD for isolated analog programming OPTION P145



- Provides galvanic isolation when programming and monitoring.

Built-in RS232 Power Supply Controller OPTION P146

- Internal RS232 compatible Controller to program a unit by a computer.

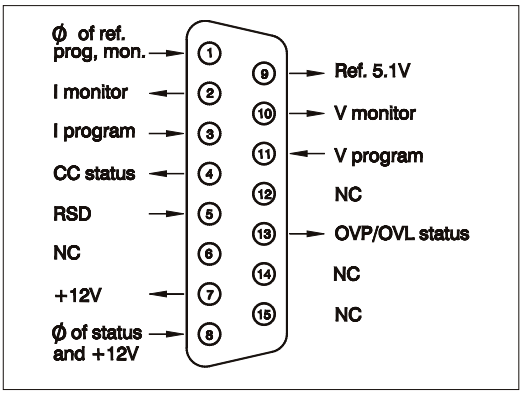
Built-in Ethernet Power Supply Controller OPTION P149

- Internal Ethernet compatible Controller to program a unit by a computer.

Built-in IEEE488 Power Supply Controller OPTION P164

- Internal IEEE488 compatible Controller to program a unit by a computer.

Note: there is only room for one of the interfaces in a unit (P145, P146, P149, P164)



Connections programming connector

CV= Constant Voltage
CC=Constant Current
OVP=Over Voltage Protector
OVL=Over Voltage Limit (Protection)

Specifications measured at
t_{amb} *= 25 ± 5 °C and Vin = 3x 380 V AC, 50 Hz unless otherwise noted.*