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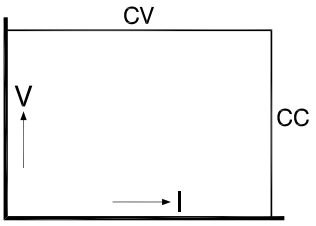
DELTA ELEKTRONIKA B.V.

SM 3000 - Series 3000 W DC POWER SUPPLIES

Models	Voltage range	Current range
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

Three phase input



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, 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 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					

Typical Applications

- Solar inverter testing, PV-Simulation
- Plasma chambers
- Hybrid Car test systems
- ATE in industrial production lines
- Automotive battery simulations
- Controlled battery (dis)charging
- Lasers
- Driving PWM-controlled DC-motors
- Accurate current sources
- 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 0.33 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 Code :
  SM 15-200 D P104 - SM 70-45 D P032
  SM 30-100 D P031 - SM 120-25 D P106
  SM 45-70 D P105 - SM 300-10 D P061

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 Code :
  SM 15-200 D P127 - SM 45-70 D P129
  SM 30-100 D P128 - SM 70-45 D P130

Sequencer

Arbitrary Waveform generator or standalone automation.
The sequencer is integrated in the Ethernet controller.

- Order Code - P149

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.

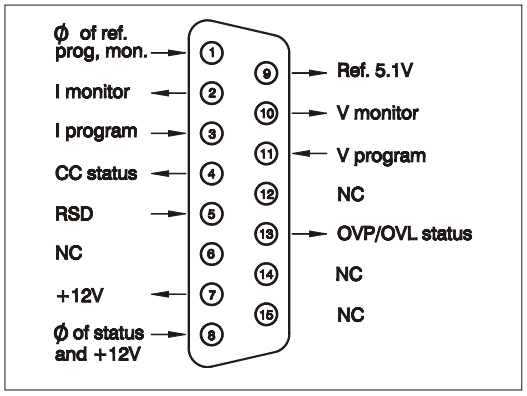
- Order Code - P001

Software control and interfaces

Factory installed programming interfaces:

- ISO AMP Card - isolated analog - P145
- RS232 controller - P146
- IEEE488 controller - P164
- Ethernet controller (incl. sequencer) - P149
- PROFIBUS controller - P275
- CANBUS controller - P276

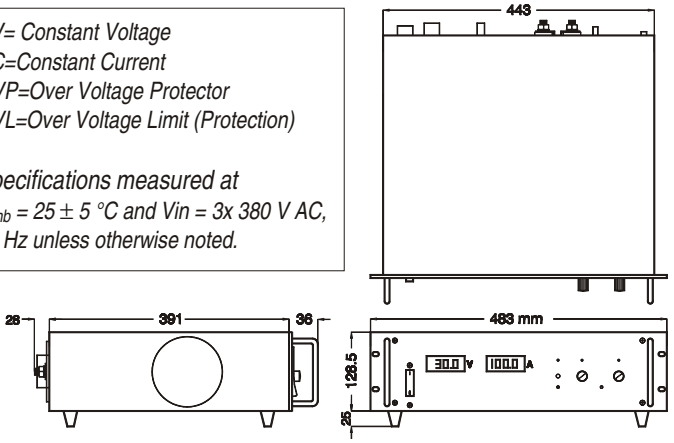
Notes: 1. Download special datasheet about High Speed Program., Power Sink and Battery Charging from www.DeltaPowerSupplies.com.
2. There is only room for one of the interfaces in a unit (P145, P146, P149, P164, P275, P276)



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.*



Analog Programming (standard) or Ethernet or RS232 or IEEE488 or CANBUS or PROFIBUS or isolated analog (all optional)

Output Terminals

No Line Cord supplied

Input Connector

Progr. Switches Manual / Program

Sense Block

***Safety Cover supplied for input**.*
Cover for output must be ordered separately.

Feet can be removed (option P099)