DELTA ELEKTRONIKA B.V.
DC POWER SUPPLIES

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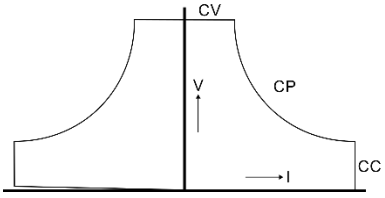
SM6K - Series 6kW DC POWER SUPPLIES

Bi-Directional - Constant Power

Models	Voltage range	Current range
SM40-CP-450	0 – 40 V	-450 – 450 A
SM75-CP-250	0 – 75 V	-250 – 250 A
SM330-CP-55	0 – 330 V	-55 – 55 A
SM1000-CP-18	0 – 1000 V	-18 – 18 A



Features

- 6 kW bidirectional DC source & sink
- Constant-power output curve for extended operating range
- Regenerative design: sink power returned to the grid
- High efficiency, resulting in low heat dissipation
- Fast digital control with tunable load response
- Rated for continuous full-power operation
- Comprehensive overload and short-circuit protection

Functionalities

- Wide-range three-phase AC input
- Expandable in functions, interfaces and Master-Slave
- Built-in Ethernet interface with browser-based web interface
- Digital encoders for voltage/current setting and navigation
- Large front-panel display with menu-driven operation
- Temperature-controlled fans for low audible noise
- EMC performance beyond CE (low emission, high immunity)

		SM40-CP-450	SM75-CP-250	SM330-CP-55	SM1000-CP-18
Output rating					
Voltage range		0 - 40 V	0 - 75 V	0 - 330 V	0 - 1000 V
Current range		– 450 - 450 A	– 250 - 250 A	– 55 - 55 A	– 18 - 18 A
Regenerative mode					
Minimum sink voltage		400 mV @ – 450 A	400 mV @ – 250 A	tbd mV @ – 55 A	tbd mV @ – 18 A
Note: Unit switches automatically		125 mV @ – 150 A	130 mV @ –83.3 A	tbd mV @ – 18.3 A	tbd mV @ – 6 A
between source ↔ sink.		80 mV @ – 45 A	100 mV @ – 25 A	tbd mV @ – 5.5 A	tbd mV @ – 1.8 A
Absolute maximum sink voltage		42 V	78 V	tbd V	tbd V
Minimum sink current		0.4 %	0.4 %	tbd %	tbd %
AC Input					
Rated voltage range		380 - 480 V			
Rated frequency		50 / 60 Hz			
Rated current		Maximum 12.2 A			
Current, 6 kW		9.8 A			
Power factor, 6 kW / 3 kW		0.995 / 0.988			
Internal fuses		15 AT			
Standby input power (V_o=I_o=0) [1]		160 W			
Standby input power (V_o=V_{max}) [1]		185 W			
Efficiency *(Sink & Source mode):*					
6 kW, I_{out}=100 %		92 %	93 %	tbd	tbd
6 kW, U_{out}=100 %		95 %	95 %	tbd	tbd
Regulation					
Load 0 – 100 % [2]	**CV**	1 mV	2 mV	tbd mV	tbd mV
Line 342 - 528 V_{AC} [2]	**CV**	1 mV	1 mV	tbd mV	tbd mV
Load 0 – 100 % [1, 3]	**CC**	40 mA	30 mA	tbd mA	tbd mA
Line 342 - 528 V_{AC} [1, 3]	**CC**	1 mA	4 mA	tbd mA	tbd mA
Ripple + noise [5]					
Source mode:		13.3 V / 450 A	24 V / 250 A	109 V / 55 A	333 V / 18 A
rms (BW = 300 kHz)	**CV**	2.5 mV	1.5 mV	tbd mV	tbd mV
p-p (BW = 20 MHz)	**CV**	15 mV	12 mV	tbd mV	tbd mV
rms (BW = 300 kHz)	**CC**	35 mA	20 mA	tbd mA	tbd mA
		40 V / 150 A	75 V / 80 A	330 V / 18.3 A	1000 V / 6 A
rms (BW = 300 kHz)	**CV**	4 mV	1.5 mV	tbd mV	tbd mV
p-p (BW = 20 MHz)	**CV**	25 mV	12 mV	tbd mV	tbd mV
rms (BW = 300 kHz)	**CC**	15 mA	8 mA	tbd mA	tbd mA
Sink mode:		13.3 V / 450 A	24 V / 250 A	109 V / 55 A	333 V / 18 A
rms (BW = 300 kHz)	**CV**	1.6 mV	1 mV	tbd mV	tbd mV
p-p (BW = 20 MHz)	**CV**	15 mV	10 mV	tbd mV	tbd mV
rms (BW = 300 kHz)	**CC**	40 mA	30 mA	tbd mA	tbd mA
		40 V / 150 A	75 V / 80 A	330 V / 18.3 A	1000 V / 6 A
rms (BW = 300 kHz)	**CV**	2.5 mV	1.5 mV	tbd mV	tbd mV
p-p (BW = 20 MHz)	**CV**	20 mV	12 mV	tbd mV	tbd mV
rms (BW = 300 kHz)	**CC**	25 mA	15 mA	tbd mA	tbd mA
Programming & monitoring accuracy [4]					
Voltage		± 0.08 %			
Current		± 0.15 %			
Temperature coefficient, per °C [1,5]					
		15 ppm	20 ppm	tbd	tbd
CV		40 ppm	40 ppm	tbd	tbd
	CC				
Stability over 8 hours [1,5]	**CV**	45 ppm	35 ppm	tbd	tbd
25 ± 1 °C	**CC** [3]	40 ppm	85 ppm	tbd	tbd

[1] *After 1 hour warm up*
[2] *Remote voltage sense*
[3] *Local voltage sense*
[4] *Excluding INT-MOD-ANA*
[5] *Measured at full load*

	SM40-CP-450	SM75-CP-250	SM330-CP-55	SM1000-CP-18
Programming speed [6, 7]				
Rise time (10 – 90 %)				
Output voltage step	0 → 13.3 V	0 → 24 V	0 → 109 V	0 → 333 V
Load = 6 kW	0.6 ms	1.5 ms	tbd ms	tbd ms
Load = 600 W	0.6 ms	1.1 ms	tbd ms	tbd ms
Output voltage step	0 → 40 V	0 → 75 V	0 → 330 V	0 → 1000 V
Load = 6 kW	2.8 ms	4.6 ms	tbd ms	tbd ms
Load = 600 W	1.9 ms	3.2 ms	tbd ms	tbd ms
Fall time (90 – 10 %)				
Output voltage step	13.3 → 0 V	24 → 0 V	109 → 0 V	333 → 0 V
Load = 6 kW	0.5 ms	1.1 ms	tbd ms	tbd ms
Load = 600 W	0.5 ms	1.1 ms	tbd ms	tbd ms
Output voltage step	40 → 0 V	75 → 0 V	330 → 0 V	1000 → 0 V
Load = 6 kW	1.4 ms	2.4 ms	tbd ms	tbd ms
Load = 600 W	1.8 ms	3.0 ms	tbd ms	tbd ms
Recovery time [8, 9]				
Condition	13.3 V, 225 → 450 A	24 V, 125 → 250 A	109 V, 28 → 55 A	333 V, 9 → 18 A
Recovery within	100 mV	100 mV	tbd mV	tbd V
di/dt of load step	5 A/µs	3 A/µs	tbd A/µs	tbd A/µs
Time	130 µs	100 µs	100 µs	100 µs
Maximum deviation	0.6 V	0.4 V	tbd V	tbd V
Condition	40 V, 75 → 150 A	75 V, 40 → 80 A	330 V, 9 → 18 A	1000 V, 3 → 6 A
Recovery within	100 mV	100 mV	tbd mV	tbd V
di/dt of load step	2 A/µs	0.9 A/µs	tbd A/µs	tbd A/µs
Time	75 µs	100 µs	150 µs	150 µs
Maximum deviation	0.25 V	0.15 V	tbd V	tbd V
DC output capacitance [10]				
X-capacitors	21 mF	9 mF	tbd µF	tbd µF
Y-capacitors	860 nF	860 nF	tbd nF	tbd nF
X-cap bleeder resistor	1.6 kΩ	3.2 kΩ	tbd kΩ	tbd kΩ
Y-cap bleeder resistor	10 MΩ	10 MΩ	tbd MΩ	tbd MΩ
Output impedance [10]				
0-1 kHz **CV**	< 1.5 mΩ	< 2 mΩ	< tbd mΩ	< tbd mΩ
1-100 kHz **CV**	< 30 mΩ	< 40 mΩ	< tbd mΩ	< tbd mΩ
Pulsating load				
Max. tolerable AC component of load current				
f > 1 kHz	85 A_{RMS}	60 A_{RMS}	tbd A_{RMS}	tbd A_{RMS}
f < 1 kHz	450 A_{pk}	250 A_{pk}	tbd A_{pk}	tbd A_{pk}
Hold-up time				
V_{out} = 100 %, P_{out} = 6 kW	7.5 ms	7.5 ms	tbd ms	tbd ms
I_{out} = 100 %, P_{out} = 6 kW	7.5 ms	7.5 ms	tbd ms	tbd ms
V_{out} = 100 %, P_{out} = 3 kW	9.5 ms	9.5 ms	tbd ms	tbd ms
Turn on delay [11]	10 s after mains switch is turned on, output power is available			
Inrush current [10]	30 A			
Safety standards	EN 61010-1			
Insulation				
AC / DC terminals	3750 V_{RMS} (1 min.)			
Creepage / clearance	8 mm			
AC power terminals / case	2500 V_{RMS}			
DC power terminals / case	1000 V_{DC} [12]			
EMC				
Emission	**EN 61326-1,** class B equipment(for use in domestic establishments)			
Immunity	**EN 61326-1,** equipment for use in industrial and domestic establishments			
Environmental conditions				
Storage temperature	– 40 to + 70 °C			
Operating temperature *Output automatically disabled at overtemperature*	– 20 to + 50 °C, Derate output to 75 % at 60 °C			
Humidity	Maximum 95 % RH, non-condensing, up to 40 °C Maximum 75 % RH, non-condensing, up to 50 °C			
IP Rating	IP20			
Pollution degree	2			
MTBF	500 000 hrs			

[6] *Measured on resistive load with power supply in CV mode, different conditions may influence the specified speed.*
[7] *Signal latency depends on the interface used & data traffic.*
[8] *Local voltage sense.*
[9] *Remote sensing and long wiring may influence the values.*
[10] *Typical*

	SM40-CP-450	SM75-CP-250	SM330-CP-55	SM1000-CP-18
Series operation Master / slave operation	Series operation not allowed			
Parallel operation Master / slave operation	tbd		tbd	
Remote sensing Maximum voltage drop per load lead	Default 1 V, can be set to 10 V			
Limits Adjustable Voltage Current Power Fixed Voltage Overload level Voltage Self-Protection level	 0 - 101 % 0 - 101 % 0 - 101 % 102.5 % - unit will continue to operate (OL-indication in display) 105 % - output is automatically disabled (PROT-indication in display)			
Potentiometers Front panel control knob resolution	15 bits			
Meter scale Voltage Current Power Accuracy read output	4 digits 0.00 - 40.00 V -450.0 - 450.0 A -6000 – 6000 W 0.2 % + 2 digit	4 digits 0.0 - 75.0 V -250.0 - 250.0 A -6000 – 6000 W 0.2 % + 2 digit	4 digits 0.0 - 330.0 V -55.0 - 55.0 A -6000 – 6000 W 0.2 % + 2 digit	4 digits 0 – 1000 V -18.00 - 18.00 A -6000 – 6000 W 0.2 % + 2 digit
Mounting	Stacking of units allowed			
AC terminals (CON A)	Screw terminals for wire 4 mm^2, 3 phase + earth (no neutral)			
DC terminals (CON B1 & B2)	M12 bolts		M8 bolts	
Programming connectors (LAN)	Standard with RJ45-connector for Ethernet, 1000 Mb/s, full-duplex			
Interlock (CON F)	Input for external floating contact			
Cooling Audio noise level Airflow direction Thermal protection	Low noise, fan speed adapts to temperature of internal system ca. 52 dBA at full load, 25 °C ambient temperature, 1 m distance ca. 66 dBA at full load, 50 °C ambient temperature, 1 m distance From left to right Output shuts down in case of insufficient cooling (over temperature indication in display)			
Dimensions Front panel: h x w behind front panel: h x w x d	 88.1 x 483 mm (19", 2 U) 86 x 448 x 586 mm (excluding feet) *No additional depth is required with optional interfaces assembled*			
Weight	16 kg			

CV = Constant Voltage
CC = Constant Current
CP = Constant Power

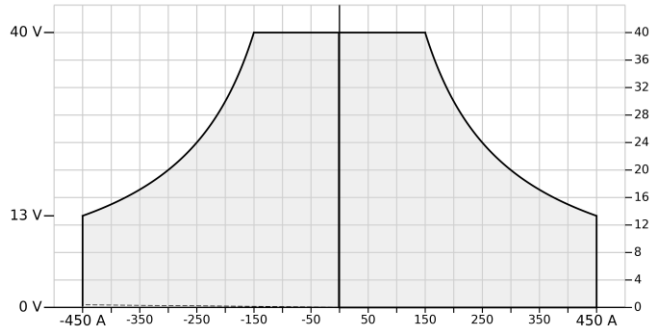
Specifications measured at T_{amb} = 25 ± 5 °C and Vin = 400 V_{AC}, 3 phase, 50 Hz unless otherwise noted.
The information in this document is subject to change without notice.

TBD = To Be Determined

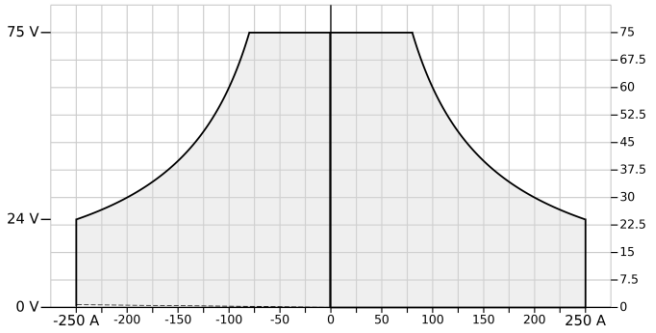
[11] *Unit should be configured to switch on the output at startup*
[12] *See "Safety Instructions" in the product manual.*

Operating range

SM40-CP-450

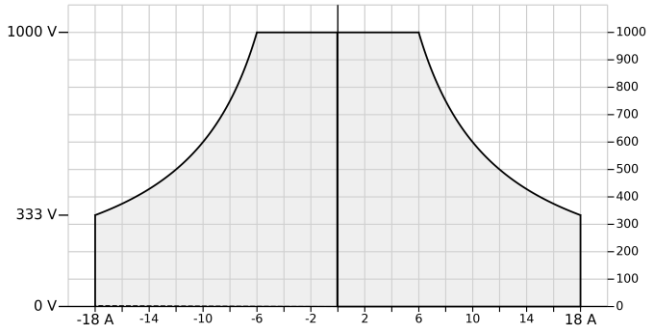


SM75-CP-250

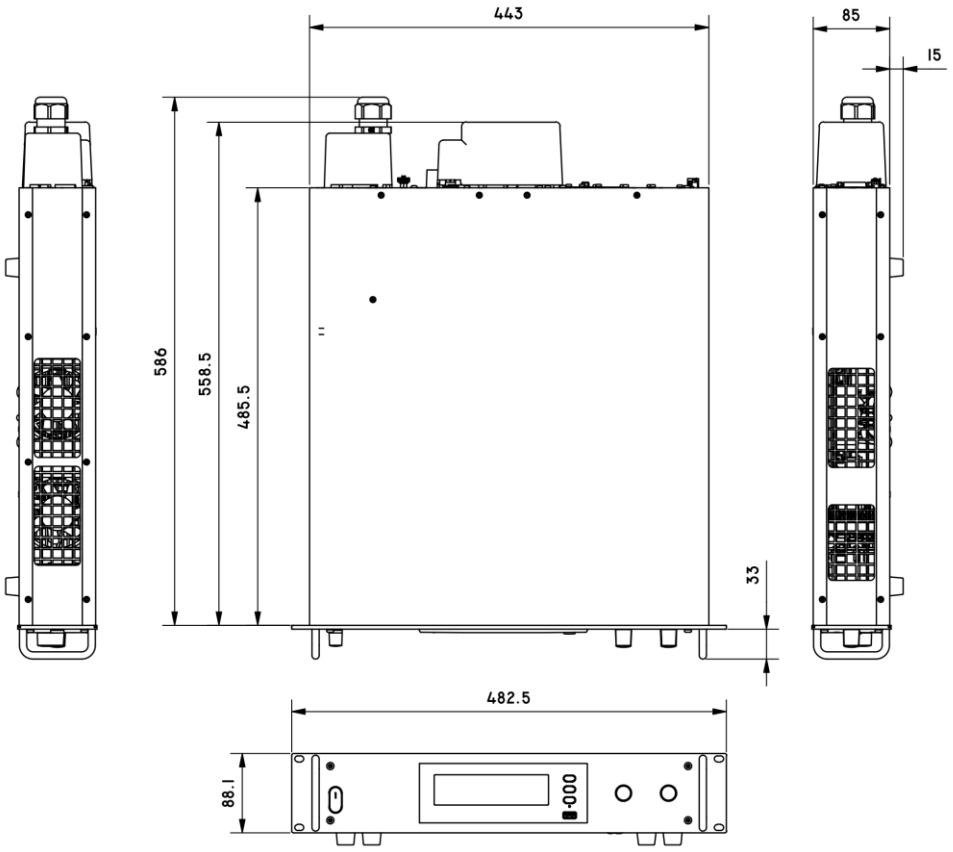


SM330-CP-55

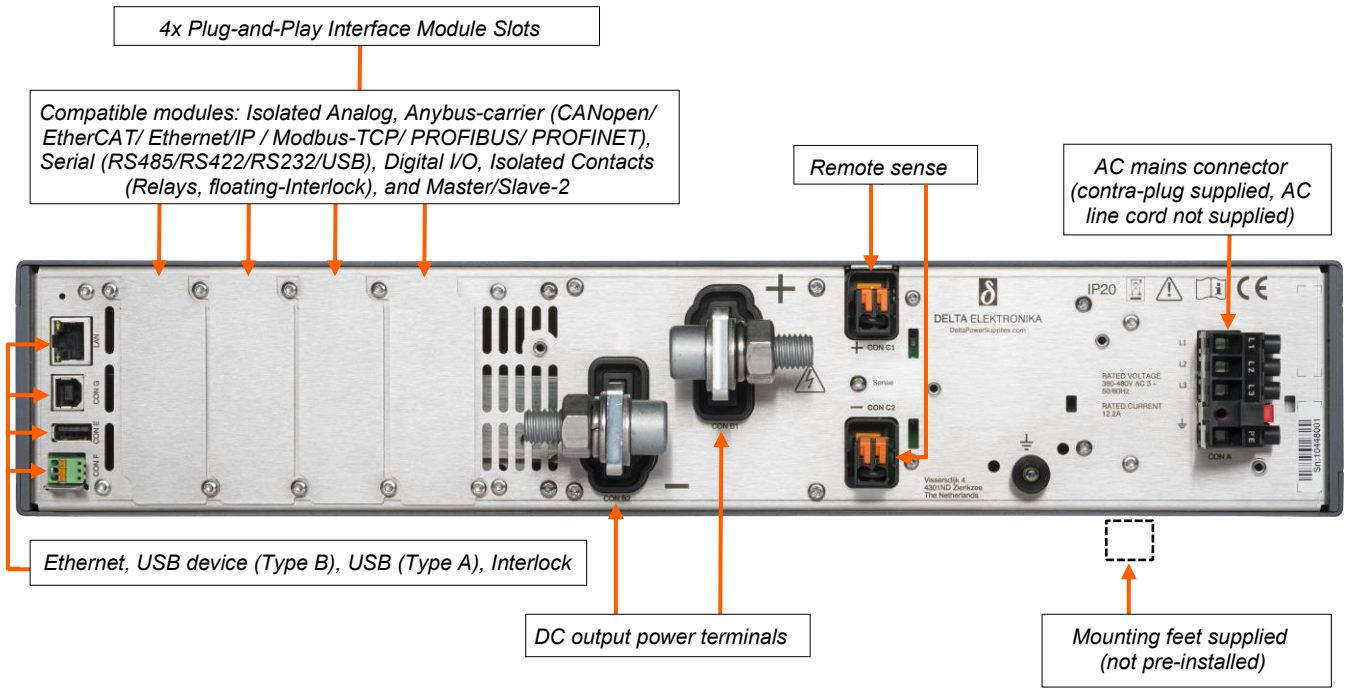
SM1000-CP-18



Dimensions



Rear view



Safety covers are supplied for in- and output (not shown)

Typical Applications

- PV simulation and inverter testing
- Automotive test systems
- Automotive battery simulation
- Controlled battery (dis)charge test
- ATE in industrial production lines
- Precision current sources
- PWM-controlled DC motor testing
- Renewable-energy systems
- Plasma chambers
- Lasers
- Aerospace applications
- Defense / military applications

Standard Features

Bi-Directional Two-Quadrant Output

Full-power bidirectional two-quadrant operation keeps the DC output voltage constant whether power is sourced or sunk. Ideal for PWM-controlled DC motors and ATE systems.

Digital CV- and CC-Settings

Long-life digital encoders on the front panel provide precise CV/CC setting with coarse/fine adjustment and full front-panel lock (including CV/CC knobs).

High Voltage Isolation

A high DC output isolation allows floating operation up to 1000 V for all types.

Sequencer

Arbitrary Waveform generator or standalone automation.

Sequencer functionality is planned for a future firmware release.

Ethernet Interface

Ethernet interface for programming and monitoring (SCPI), including an integrated web interface for remote control.

USB-Input

Front and rear USB inputs are intended for exchanging settings and waveform files. Sequences can be uploaded via the web interface.

USB input functionality is planned for a future firmware release.

Interfaces

Plug-and-play extension modules

The interfacing and functional capabilities of the power supply can be extended at any time by inserting plug-and-play modules. Four slots are available at the rear of the power supply unit.
See the Interfaces data sheet for details.

Interface module functionality is planned for a future firmware release.

Modules:

- **Isolated Analog programming**
  (INT-MOD-ANA)
  High speed and accurate analog programming and monitoring.
- **Anybus-carrier**
  (INT-MOD-ANY)
  Carrier for AnyBus CompactCom 40 fieldbus inserts:
  CANopen, EtherCAT, Ethernet/IP, Modbus-TCP, PROFIBUS, PROFINET.
- **Digital I/O**
  (INT-MOD-DIG)
  Interacts with sequencer and Ethernet programming.
- **Isolated contacts**
  (INT-MOD-CON)
  Programmable relays and floating interlock.
- **Serial communication**
  (INT-MOD-SER)
  RS232, RS485, RS422, USB.
- **Master/Slave**
  (INT MOD M/S-2)
  Series/parallel output functionality.

Ordering Information

A complete overview of base-unit order codes, optional interface modules, Anybus options, and output assembly kits is provided in the SM6K Order Codes document on our website. For product details, downloads, and quotation requests, please visit the SM6K series page or contact Delta Elektronika or your local authorized distributor.

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Online resources

- SM6K product page
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- Authorized distributors

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