

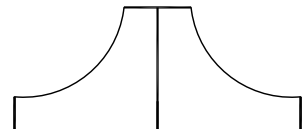


CE

SM 15K - Series 15kW DC POWER SUPPLIES

Bi-Directional - Constant Power

Models	Voltage range	Current range
SM 70-CP-450	0 ... 70 V	-450 ... 450 A
SM 500-CP-90	0 ... 500 V	-90 ... 90 A
SM 1500-CP-30	0 ... 1500 V	-30 ... 30 A



Features

- Bi-Directional power supply, standard 15kW Source & Sink
- Flexible output with constant power characteristic
- Power Regeneration Technology: sink power is not dissipated but fed back into the grid
- Designed for long life at continuous full power
- Excellent dynamic response to load changes, digital controlled with the possibility to adapt to the type of load
- Very low heat dissipation, efficiency > 95%
- Protected against all overload and short circuit conditions

Functionalities

- Operation on a wide range of three phase AC input voltages
- Standard Ethernet & Web interface
- EMC surpasses CE requirements: low emission & high immunity
- Low audible noise: temperature controlled cooling fans
- Durable digital encoders for voltage & current adjustment and menu operation
- Large user display, menu driven operations

	SM70-CP-450	SM500-CP-90	SM1500-CP-30
DC Power terminals voltage current	0 ... 70 V -450 ... 450 A	0 ... 500 V -90 ... 90 A	0 ... 1500 V -30 ... 30 A
AC Input 3 phase, 48 - 62 Hz rated voltage range rated frequency rated current current (400 V / 3 ph, 15 kW) power factor, 15 kW, 7,5 kW internal fuses standby AC input power ($V_o=I_o=0$) standby AC input power ($V_o=V_{max}$)		342 ... 528 V 380 ... 480 V 50 / 60 Hz maximum 27 A 23 A 0.996, 0.988 30 AT 96 180 W	
Efficiency Sink & Source mode: 400 V AC, 3 ph input, 15 kW, $I_{out}=100\%$ 15 kW, $U_{out}=100\%$		95 % 96 %	
Regulation			
Load 0 - 100% CV Line 342 - 528 V AC CV (external voltage sense)	6 mV < 1 mV	4 mV < 1 mV	10 mV < 1 mV
Load 0 - 100% CC Line 342 - 528 V AC CC (internal voltage sense, after warm-up)	35 mA 4 mA	8 mA 1 mA	2 mA 1 mA
Ripple + noise Source mode: rms (BW=300 kHz) CV p-p (BW=20 MHz) CV rms (BW=300 kHz) CC p-p (BW=20 MHz) CC Source mode: rms (BW=300 kHz) CV p-p (BW=20 MHz) CV rms (BW=300 kHz) CC p-p (BW=20 MHz) CC Sink mode: rms (BW=300 kHz) CV p-p (BW=20 MHz) CV rms (BW=300 kHz) CC p-p (BW=20 MHz) CC Sink mode: rms (BW=300 kHz) CV p-p (BW=20 MHz) CV rms (BW=300 kHz) CC p-p (BW=20 MHz) CC <i>CC-ripple at full load</i>	33 V / 450 A 10 mV 60 mV 100 mA - 70 V / 215 A 10mV 60mV 100 mA - 33 V / 450 A 8 mV 50 mV 100 mA - 70 V / 215 A 8 mV 50 mV 100 mA -	167 V / 90 A 10 mV 55 mV 45 mA 200 mA 500 V / 30 A 25mV 115mV 45 mA 200 mA 167 V / 90 A 7 mV 35 mV 45 mA 200 mA 500 V / 30 A 10 mV 50 mV 90 mA 320 mA	500 V / 30 A 25 mV 150 mV 12 mA 70 mA 1500 V / 10 A 35mV 250mV 5 mA 25 mA 500 V / 30 A 15 mV 130 mV 10 mA 60 mA 1500 V / 10 A 25 mV 200 mV 3 mA 12 mA
Programming & monitoring accuracy (excluding INT MOD ANA) Voltage Current		$\pm 0.08\%$ $\pm 0.15\%$	
Minimum Sink Voltage			
@ Sink current:	1.2 V @ -450 A 0.8 V @ -215 A 0.8 V @ -45 A	5.5 V @ -90 A 3.0 V @ -30 A 1.0 V @ -10 A	16.0 V @ -30 A 7.0 V @ -10 A 2.0 V @ -3 A
Temp. coeff., per °C¹ CV CC		$20 \cdot 10^{-6}$ $50 \cdot 10^{-6}$	
Stability¹ after 1 hr warm-up during 8 hrs CV CC $t_{amb} = 25 \pm 1 \text{ }^\circ\text{C}$, $V_{in} = 400 \text{ V AC}$ internal voltage sensing for CC-stab.		$50 \cdot 10^{-6}$ $80 \cdot 10^{-6}$	

Notes: 1. Measured at full load
2. Signal latency depends on the interface used and data traffic.
3. See 'Safety Instructions' in the Product Manual.

Programming speed ² (resistive load)	SM70-CP-450	SM500-CP-90	SM1500-CP-30
Rise time (10 - 90%) output voltage step time, (load = 15 kW) time, (load = 1500 W)	0 → 33 V 2.2 ms 1.5 ms	0 → 167 V 1.5 ms 1 ms	0 → 500 V 1.5 ms 1 ms
output voltage step time, (load = 15 kW) time, (load = 1500 W)	0 → 70 V 5.5 ms 3.5 ms	0 → 500 V 4.5 ms 3.5 ms	0 → 1500 V 4.5 ms 3.5 ms
Fall time (90 - 10%) output voltage step time, (load = 15 kW) time, (load = 1500 W)	33 → 0 V 1.5 ms 1.5 ms	167 → 0 V 0.8 ms 0.9 ms	500 → 0 V 0.8 ms 0.9 ms
output voltage step time, (load = 15 kW) time, (load = 1500 W)	70 → 0 V 2.6 ms 3.5 ms	500 → 0 V 2.5 ms 3.5 ms	1500 → 0 V 2.8 ms 3.5 ms
DC Output Capacitance X-capacitors (typical) Y-capacitors (typical)	22000 µF 950 nF	560 µF 145 nF	58 µF 145 nF

	SM70-CP-450	SM500-CP-90	SM1500-CP-30
Recovery time output voltage recovery within di/dt of load step time, @ 50 - 100% load step max. deviation	33 V, load step 225 → 450 A 100 mV 5 A/µs 100 µs 0.8 V	167 V, load step 45 → 90 A 750 mV 0.8 A/µs 100 µs 2.8 V	500 V, load step 15 → 30 A 2.8 V 0.25 A/µs 100 µs 9.0 V
output voltage recovery within di/dt of load step time, @ 50 - 100% load step max. deviation	70 V, load step 112 → 215 A 100 mV 2 A/µs 100 µs 0.3 V	500 V, load step 15 → 30 A 500 mV 0.25 A/µs 150 µs 1.2 V	1500 V, load step 5 → 10 A 1.2 V 0.085 A/µs 150 µs 3.5 V
Pulsating load max. tolerable AC component of load current f > 1 kHz f < 1 kHz	60 Arms 450 Apeak	15 Arms 90 Apeak	5 Arms 30 Apeak

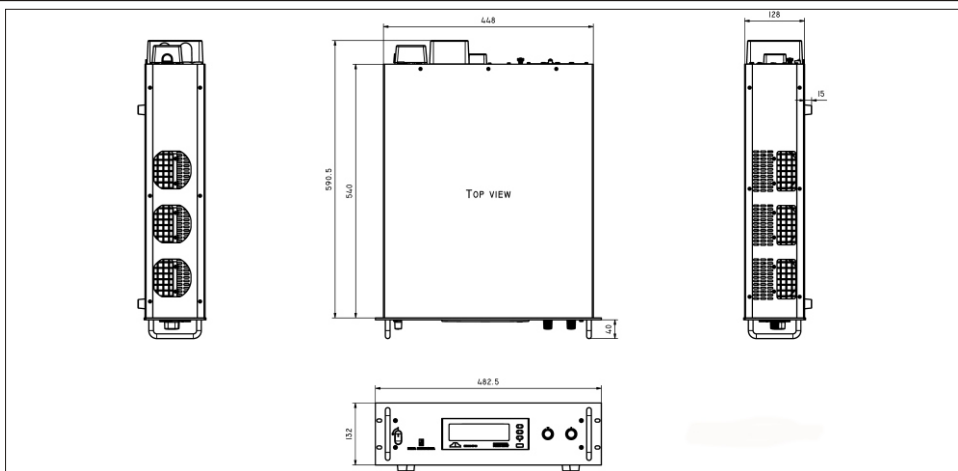
Insulation AC pwr terminals / DC pwr terminals creepage / clearance AC power terminals / case DC power terminals / case	3750 Vrms (1 min.) 8 mm 2500 Vrms 1000 V DC ³	3750 Vrms (1 min.) 8 mm 2500 Vrms 1500 V DC ³
Safety	EN 60950 / EN 61010	
EMC Generic Emission Generic Immunity	EN 61000-6-3, residential, light industrial environment (EN 55022 B) EN 61000-6-2, industrial environment	
Operating Temperature at full load	- 20 ... 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 ... 85 °C	
Thermal protection	output shuts down in case of insufficient cooling	
MTBF	500 000 hrs	

	SM70-CP-450	SM500-CP-90	SM1500-CP-30
Hold-Up time V _{out} = 100%, P _{out} = 15kW I _{out} = 100%, P _{out} = 15kW V _{out} = 100%, P _{out} = 7.5kW @ 400 V AC input	10 ms 10 ms 25 ms	15 ms 15 ms 35 ms	15 ms 15 ms 35 ms
Turn on delay after mains switch on	2.5 s		
Inrush current	23 A		

Notes: 1. Measured at full load.
2. Signal latency depends on the interface used and data traffic.
3. See 'Safety Instructions' in the manual.

	SM70-CP-450	SM500-CP-90	SM1500-CP-30
Series operation max. total voltage	Not possible	750 V* 1000 V**	Not possible
Master / Slave operation		maximum 6 units ³ *) delivered before Q4 / 2018 **) delivered Q4 / 2018 or newer Contact factory for upgrading to 1000V series operation for older units.	
Parallel operation Master / Slave operation	maximum 6 units <i>contact factory for more units</i>	maximum 60 units	maximum 60 units
Remote sensing max. voltage drop per load lead	default 1 V, can be set to 10 V		
Limits			
Voltage adjust range	0 ... 101 %		
Current adjust range	0 ... 101 %		
Power adjust range	0 ... 101 %		
Potentiometers & Encoders front panel control with knobs resolution	15 bits.		
Meters			
scale voltage	4 digit 0.00 ... 70.00 V	4 digit 0.0 ... 500.0 V	4 digit 0 ... 1500 V
scale current	-450.0 ... 450.0 A	-90.0 ... 90.0 A	-30.00 ... 30.00 A
scale power	-15000 ... 15000 W	-15000 ... 15000 W	-15000 ... 15000 W
accuracy read output	0.2% + 2 digit	0.2% + 2 digit	0.2% + 2 digit

Mounting	stacking of units allowed, air flow is from left to right		
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 at rear panel		
Interlock (CON F)	input for contact at rear panel		
Cooling	low noise blower, fan speed adapts to temperature of internal system		
audio noise level	ca. 50 dBA at full load, 25 °C ambient temperature, 1 m distance		
airflow	ca. 65 dBA at full load, 50 °C ambient temperature, 1 m distance From left to right		
Enclosure degree of protection	IP20		
Dimensions	132 x 483 mm (19", 3 U) 128 x 448 x 591 mm (excluding feet) <i>no extra depth is required with optional interfaces assembled.</i>		
Weight	27 kg		



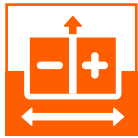
CV= Constant Voltage, CC= Constant Current
 CP= Constant Power
 Specifications measured at $T_{amb} = 25 \pm 5 \text{ }^\circ\text{C}$ and $V_{in} = 400 \text{ VAC}$, 50 Hz, 3 phase, unless otherwise noted. The information in this document is subject to change without notice.

- Notes:
1. Measured at full load.
 2. Signal latency depends on the interface used and data traffic.
 3. See 'Safety Instructions' in the manual.

Typical Applications

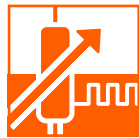
- Solar inverter testing, PV-Simulation
- Automotive battery simulations
- Driving PWM-Controlled DC motors
- Car testing systems
- Controlled battery (dis)charging
- Accurate current sources
- ATE in industrial production lines
- Lasers
- Aerospace and military equipment
- Plasma chambers
- Sustainable energy

Standard Features



Bi-Directional Two-Quadrant Output

Full power Bi-Directional two quadrant operation maintains the DC output voltage constant whether the output power is positive or negative. Ideal for PWM-speed controlled DC-Motors and ATE systems.



Digital CV-, CC- and CP-Settings

Reliable, longlife 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.



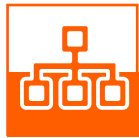
Sequencer

Arbitrary Waveform generator or standalone automation.



High Voltage Isolation

A high DC output isolation allows floating operation up to 1000 V for SM70-CP-450 and SM500-CP-90, and up to 1500 V for SM1500-CP-30.



Ethernet Interface

Ethernet interface for programming and monitoring.



USB-Input

Not yet available: Front and rear panel USB-Input for exchange of settings and waveforms (Host / Type-A), or for controlling the unit (Device / Type-B).

Options



Software Control and Interfaces

Field installable interfaces:

- Master / Slave controller
 - Isolated Contacts
 - Serial controller with multiple protocols
RS 232, RS 485, RS 422 and USB (Device)
 - Digital I/O
 - Isolated Analog Programming
- Order Codes :
- . INT MOD M/S-2
 - . INT MOD CON
 - . INT MOD SER
 - . INT MOD DIG
 - . INT MOD ANA

