

		SM70-CP-450	SM210-CP-150	SM 500-CP-90	SM 1500-CP-30
DC Power terminals voltage current		0 - 70 V - 450 - 450 A	0 - 210 V - 150 - 150 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, 15kW) power factor, 15kW, 7.5kW internal fuses standby input power ($V_o=I_o=0$) standby 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 W 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% Line 342 - 528 V AC (external voltage sense)	CV CV	6 mV < 1 mV	5 mV < 1 mV	4 mV < 1 mV	10 mV < 1 mV
Load 0 - 100% Line 342 - 528 V AC (internal voltage sense, after warm up)	CC CC	35 mA 4 mA	12 mA 3 mA	8 mA 1 mA	2 mA 1 mA
Ripple + noise Source mode: rms (BW=300 kHz) p-p (BW=20 MHz) rms (BW=300 kHz) p-p (BW=20 MHz) Source mode: rms (BW=300 kHz) p-p (BW=20 MHz) rms (BW=300 kHz) p-p (BW=20 MHz) Sink mode: rms (BW=300 kHz) p-p (BW=20 MHz) rms (BW=300 kHz) p-p (BW=20 MHz) Sink mode: rms (BW=300 kHz) p-p (BW=20 MHz) rms (BW=300 kHz) p-p (BW=20 MHz)	CV CV CC CC CV CV CC CC CV CV CC CC	33 V / 450 A 10 mV 60 mV 100 mA - 70 V / 215 A 10 mV 60 mV 100 mA - 33 V / 450 A 8 mV 50 mV 100 mA - 70 V / 215 A 8 mV 50 mV 100 mA -	100 V / 150 A 30 mV 125 mV t.b.d. - 210 V / 71.5 A 20 mV 100 mV t.b.d. - 100 V / 150 A 30 mV 125 mV t.b.d. - 210 V / 71.5 A 20 mV 100 mV t.b.d. -	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
<i>CC-ripple at full load</i>					
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	3.0 V @ - 150 A 1.5 V @ - 75 A 1.5 V @ - 15 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 °C	CV CC	20.10 ⁻⁶ 50.10 ⁻⁶			
Stability ¹ after 1 hr warm-up during 8 hrs $t_{amb} = 25 \pm 1$ °C, $V_{in} = 400$ VAC (internal voltage sensing for CC-stab.)	CV CC	50.10 ⁻⁶ 80.10 ⁻⁶			

Programming speed ² (resistive load)	SM70-CP-450	SM210-CP-150	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 → 100 V 1.6 ms 1.3 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 → 210 V 3 ms 2.7 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	100 → 0 V 1.3 ms 1.3 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	210 → 0 V 2.5 ms 2.5 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	1170 µF 950 nF	560 µF 145 nF	58 µF 145 nF

	SM70-CP-450	SM210-CP-150	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, 225 → 450 A 100 mV 5 A/µs 100 µs 0.8 V	100 V, 75 → 150 A 500 mV 2.4 A/µs 100 µs 1.4 V	167 V, 45 → 90 A 750 mV 0.8 A/µs 100 µs 2.8 V	500 V, 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, 112 → 215 A 100 mV 2 A/µs 100 µs 0.3 V	210V, 36 → 72 A 250 mV 1.15 A/µs 100 µs 0.75 V	500 V, 15 → 30 A 500 mV 0.25 A/µs 150 µs 1.2 V	1500 V, 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 150 Apeak	15 Arms 90 Apeak	5 Arms 30 Apeak

Insulation AC power 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 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	
Storage temperature	- 40 to + 85 °C	
Thermal protection	output shuts down in case of insufficient cooling	
MTBF	500 000 hrs	

	SM70-CP-450	SM210-CP-150	SM500-CP-90	SM1500-CP-30
Hold-Up time (@ 400 VAC input) V _{out} = 100%, P _{out} = 15 kW I _{out} = 100%, P _{out} = 15 kW V _{out} = 100%, P _{out} = 7.5 kW	10 ms 10 ms 25 ms	10 ms 10 ms 20 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 & data traffic.

3. See "Safety instructions"

	SM70-CP-450	SM210-CP-150	SM 500-CP-90	SM 1500-CP-30
Series operation max. total voltage	Not possible	Not possible	750V* 1000V**	Not possible
Master / Slave operation			maximum 6 units ³ *) units delivered before Q4 / 2018 **) units delivered Q4 / 2018 or newer Contact factory for upgrading to enable 1000V series operation for older units.	
Parallel operation Master / Slave operation	maximum 6 units contact factory for more units	t.b.d.	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 Current adjust range Power adjust range 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 with knobs resolution	15 bits			
Meters scale voltage scale current scale power accuracy read output	4 digit 0.00 - 70.00 V - 450.0 - 450.0 A - 15000 - 15000 W 0.2% + 2 digit	4 digit 0.0 - 210.0 V - 150.0 - 150.0 A - 15000 - 15000 W 0.2% + 2 digit	4 digit 0.0 - 500.0 V - 90.0 - 90.00 A - 15000 - 15000 W 0.2% + 2 digit	4 digit 0 - 1500 V - 30.00 - 30.00 A - 15000 - 15000 W 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 audio noise level air flow	low noise blower, fan speed adapts to temperature of internal system ca. 50 dBA at full load, 25 °C ambient temperature, 1 m distance ca. 65 dBA at full load, 50 °C ambient temperature, 1 m distance From left to right			
Enclosure degree of protection	IP20			
Dimensions front panel: h x w behind front panel: h x w x d	132 x 483 mm (19", 3 U) 128 x 448 x 591 mm (excluding feet) no extra depth is required with optional interfaces assembled			
Weight	27 kg			

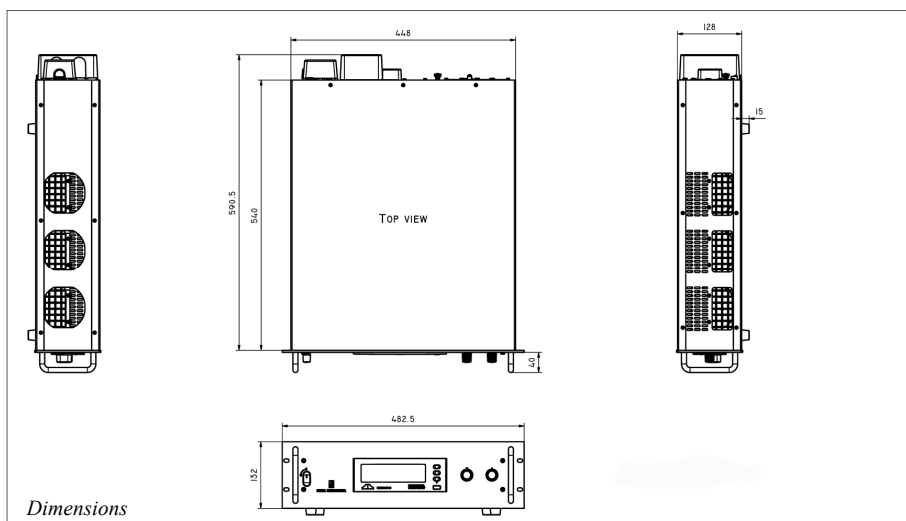
CV = Constant Voltage
CC = Constant Current
CP = Constant Power

Specifications measured at
 $t_{amb} = 25 \pm 5 \text{ }^\circ\text{C}$ and $V_{in} = 400 \text{ VAC}$,
50 Hz 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 operating manual.



Typical Applications

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

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, 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.



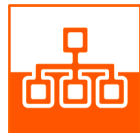
Sequencer

Arbitrary Waveform generator or standalone automation.



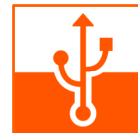
High Voltage Isolation

A high DC output isolation allows floating operation up to 1000 V for SM70-CP-450, SM210-CP-150 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

