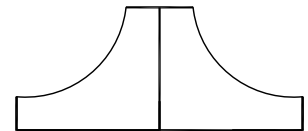




SM 15K - Series 15kW DC POWER SUPPLIES

Bi-Directional - Constant Power

Models	Voltage range	Current range
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 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

	SM500-CP-90	SM1500-CP-30
DC Power terminals voltage current	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 W 180 W	
Efficiency Sink & Source mode: 400 V AC, 3 ph input, 15 kW, 167 V, 90 A 15 kW, 500 V, 30 A		95 % 96 %
Regulation		
Load 0 - 100% CV Line 342 - 528 V AC CV (external voltage sense)	4 mV < 1 mV	10 mV < 1 mV
Load 0 - 100% CC Line 342 - 528 V AC CC (internal voltage sense, after warm-up)	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>	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 Voltage Current (excluding INT MOD ANA)		± 0.08% ± 0.15%
Minimum Sink Voltage		
@ Sink current:	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		20.10 ⁻⁶ 50.10 ⁻⁶
Stability¹ after 1 hr warm-up during 8 hrs CV CC $t_{amb} = 25 \pm 1 \text{ °C}$, $V_{in} = 400 \text{ V AC}$ internal voltage sensing for CC-stab.		50.10 ⁻⁶ 80.10 ⁻⁶

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

	SM500-CP-90	SM1500-CP-30
Programming speed ² (resistive load)		
Rise time (10 - 90%) output voltage step time, (load = 15 kW) time, (load = 1500 W)	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 → 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)	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)	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)	560 μF 145 nF	58 μF 145 nF

	SM500-CP-90	SM1500-CP-30
Recovery time output voltage recovery within di/dt of load step time, @ 50 - 100% load step max. deviation	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	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	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	

	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	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.

	SM500-CP-90	SM1500-CP-30
Series operation max. total voltage Master / Slave operation	750V* 1000V** maximum 6 units ³ *) units delivered before quarter Q4 / 2018 **) units delivered Q4 / 2018 or newer Contact factory for upgrading to enable 1000V series operation for older units.	Not possible
Parallel operation Master / Slave operation	maximum 12 units for 13...20 units contact factory	Under development
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 0.0 ... 500.0 V	4 digit 0.0 ... 1500.0 V
scale current	-90.0 ... 90.0 A	-30.0 ... 30.0 A
scale power	-15000 ... 15000 W	-15000 ... 15000 W
accuracy read output	0.2% + 2 digit	0.2% + 2 digit

Mounting	stacking of units allowed, air flow is from left to right
AC Terminals	screw Terminals for wire 4 mm ² , 3 phase + earth (no neutral), CON A
DC Terminals	M8 bolts, CON B1 & CON B2
Programming connectors	standard with RJ45-connector for Ethernet at rear panel, LAN
Interlock	input for contact at rear panel, CON F
Cooling audio noise level airflow	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) <i>no extra depth is required with optional interfaces assembled.</i>
Weight	27 kg

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

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

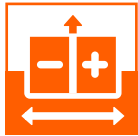
Specifications measured at
 $T_{amb} = 25 \pm 5 \text{ °C}$ and $V_{in} = 400 \text{ VAC}$,
50 Hz, 3 phase, unless otherwise noted.

The information in this document is
subject to change without notice.

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

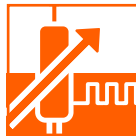
Standard Features



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, 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.



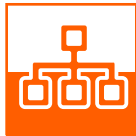
Sequencer

Arbitrary Waveform generator or standalone automation.



High Voltage Isolation

A high DC output isolation allows series operation up to 1000 V for SM500-CP-90.



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

Order Codes :

- INT MOD M/S-2
- INT MOD CON
- INT MOD SER
- INT MOD DIG

Under development are:

- Simulation Interface
- Isolated Analog Programming

