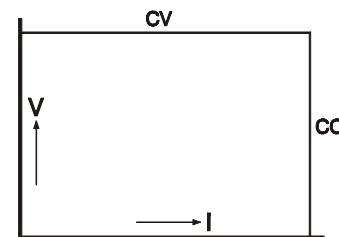




SM6000 - series
6000 watts DC POWER SUPPLIES

Three phase input

SM 15-400	0 - 15 V	0 - 400 A
SM 30-200	0 - 30 V	0 - 200 A
SM 45-140	0 - 45 V	0 - 140 A
SM 60-100	0 - 60 V	0 - 100 A
SM 70-90	0 - 70 V	0 - 90 A
SM 120-50	0 - 120 V	0 - 50 A
SM 300-20	0 - 300 V	0 - 20 A



- Efficiency up to 90 %
- Weight 27 kg
- 3 phase 380V, 400V, 415V AC input
480V optional
(50 - 60 Hz, line to line voltage)
- Active Power Factor Correction, PF=0.98
- 200 kHz MOSFET power conversion technique
- 0 - 5 V analog programmable
(on both voltage and current)
- Isolated analog programming with optional
ISO AMP CARD to prevent earth loops
- **IEEE 488** or **RS232** programming with optional
interface cards
- Very low HF-emission, OK for **light** industrial envi-
ronment, immunity OK for industrial environment
- Very low output ripple and spikes
- Very stable output voltage or current ($5 \cdot 10^{-5}$ - 10^{-4})
- Excellent dynamic response to load changes
- Master / Slave parallel and series operation with
equal current and voltage sharing
- Can be used as a building block to form a high
power unit
- Designed for long life at full power
- Protected against all overload and short circuit
conditions
- Voltage and current control with 10 turn potentiom-
eters, resolution 0.03 %
- Low noise blower, fan speed adapts to tempera-
ture
- Output On/Off button, Interlock-connector

	SM 15-400	SM 30-200	SM 45-140	SM 60-100	SM70-90	SM120-50	SM 300-20	
Output voltage current	0 - 15 V 0 - 400 A	0 - 30 V 0 - 200 A	0 - 45 V 0 - 140 A	0 - 60 V 0 - 100 A	0 - 70 V 0 - 90 A	0 - 120 V 0 - 50 A	0 - 300 V 0 - 20 A	
Input AC 3 phase, 50 - 60 Hz for use at 380V, 400V, 415V nominal line - line voltage For 480V (USA), consult factory	342 - 457 V	342 - 457 V	342 - 457 V	342 - 457 V	342 - 457 V	342 - 457 V	342 - 457 V	
current (400V / 3 ph, full load)	10.2 A	10 A	10.3 A	10 A	10.4 A	9.9 A	10 A	
power factor, 100%, 50% load	0.98, 0.97	0.98, 0.97	0.98, 0.97	0.98, 0.97	0.98, 0.97	0.98, 0.97	0.98, 0.97	
internal fuses	16 AT	16 AT	16 AT	16 AT	16 AT	16 AT	16 AT	
standby input power (Vo=Io=0)	55 W	55 W	55 W	55 W	55 W	55 W	55 W	
standby input power (Vo=V _{max})	110 W	110 W	110 W	110 W	130 W	130 W	120 W	
Efficiency 400 VAC, 3 ph input, full load	87 %	89 %	90 %	89 %	89 %	89 %	89 %	
Regulation								
Load 0 - 100% Line 342 - 457 V AC (external voltage sense)	CV CV	2.5 mV 0.2 mV	5 mV 0.5 mV	5 mV 1 mV	5 mV 2 mV	5 mV 2 mV	8 mV 2 mV	15 mV 3 mV
Load 0 - 100% Line 342 - 457 V AC (internal voltage sense, after warm-up)	CC CC	24 mA 4 mA	12 mA 2 mA	9 mA 1.5 mA	6 mA 1 mA	5 mA 1 mA	3 mA 0.5 mA	1.2 mA 0.2 mA
Ripple + noise								
rms (BW=300 kHz) p-p (BW=50 MHz)	CV CV	0.8 mV 8 mV	1 mV 8 mV	1.5 mV 10 mV	2 mV 10 mV	2 mV 10 mV	3 mV 25 mV (20 mV @ full load)	5 mV 50 mV (30 mV @ full load)
rms (BW=300 kHz) p-p (BW=50 MHz) CC-ripple at full load	CC CC	100 mA 300 mA	20 mA 60 mA	8 mA 25 mA	3 mA 10 mA	3 mA 10 mA	3 mA 10 mA	2 mA 5 mA
Temp. coeff., per °C	CV CC	35.10 ⁻⁶ 60.10 ⁻⁶						
Stability after 1 hr warm-up during 8 hrs	CV CC	5.10 ⁻⁵ 10.10 ⁻⁵						
t _{amb} = 25 ± 1 °C, V _{in} = 400 VAC internal voltage sensing for CC-stab.								

Analog Programming	CV	CC
Programming inputs input range accuracy offset temp. coeff. offset input impedance	0 - 5 V ± 0.2% - 0.1 ... +1.3 mV (on 5V) 10 μV / °C > 1 MOhm	0 - 5 V ± 0.5% 0 ... +2.2 mV (on 5V) 50 μV / °C > 1 MOhm
Monitoring output output range accuracy offset temp. coeff. offset output impedance	0 - 5 V ± 0.2% - 1... 0 mV (on 5V) 3 μV / °C 2 Ohm / max. 4 mA	0 - 5 V ± 0.5% - 1.1 ... 0 mV (on 5V) 60 μV / °C 2 Ohm / max. 4 mA

Reference voltage on prog. connector	V _{ref} TC	5.114 ± 15 mV (R _o = 2 Ohm, max. 4 mA) 20 ppm / °C
+12V output on prog. Connector	V _o I _{max} R _o	12 V ± 0.2 V 0.2 A 3 Ohm

Status outputs CC - status LIM - status OT - status PSOL - status ACF - status DCF - status	CC - operation CV or CC limit Over Temperature Power Sink Overload AC - Fail DC - Fail ¹⁾	5V = logic 1 (Ro = 500 Ohm) 5V = logic 1 (Ro = 500 Ohm) 5V = logic 1 (Ro = 500 Ohm) 5V = logic 1 (Ro = 500 Ohm) 5V = logic 1 (Ro = 500 Ohm) 5V = logic 1 (Ro = 500 Ohm)
Relay Outputs ACF DCF	AC - Fail DC - Fail ¹⁾	both NO and NC contact both NO and NC contact ¹⁾ output ± 5% beyond set point
Remote shutdown	with + 5V, 1 mA or relay contact	
Indicators (front panel)	AC-Fail, DC-Fail, Over Temperature, Power Sink Overload, Remote-Shutdown, Remote-CV, Remote-CC, Output On, CV-limit, CC-limit, CV- and CC- mode	
Controls (front panel)	Mains on/off, CV-and CC-potmeter, CV- and CC-limit-potmeter, Display-Settings button, Display-Limits button, Remote/Local, Output On/Off, Frontpanel Lock	

Programming speed (resistive load)	SM 15-400	SM 30-200	SM 45-140	SM 60-100	SM 70-90	SM 120-50	SM 300-20
Rise time (10 - 90%) output voltage step time, (100 % load) time, (10 % load)	0 → 15 V 3.3 ms 1.3 ms	0 → 30 V 6.4 ms 2.5 ms	0 → 45 V 2.7 ms 1.1 ms	0 → 60 V 5.4 ms 2.2 ms	0 → 70 V 6.8 ms 2.8 ms	0 → 120 V 5.1 ms 1.9 ms	0 → 300 V 8.5 ms 3.2 ms
Fall time (90 - 10%) output voltage step time, (100 % load) time, (10 % load)	15 → 0 V 3.5 ms 34 ms	30 → 0 V 6.7 ms 67 ms	45 → 0 V 2.9 ms 32 ms	60 → 0 V 5.8 ms 59 ms	70 → 0 V 7.7 ms 77 ms	120 → 0 V 4.9 ms 52 ms	300 → 0 V 8.3 ms 83 ms

For High Speed versions (5 - 10 times faster), consult factory.

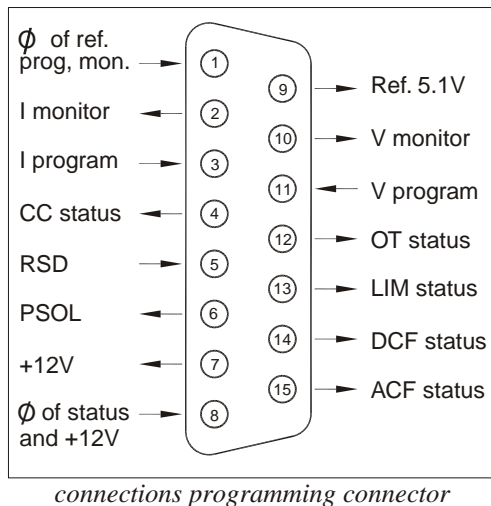
	SM 15-400	SM 30-200	SM 45-140	SM 60-100	SM 70-90	SM 120-50	SM 300-20
Recovery time recovery within di/dt of load step output voltage time, @ 50 - 100% load step max. deviation	60 mV 5 A/μs 13 V 120 μs 320 mV	50 mV 2.5 A/μs 25 V 100 μs 260 mV	100 mV 1.8 A/μs 40 V 100 μs 380 mV	100 mV 1.3 A/μs 55 V 100 μs 250 mV	100 mV 1.7 A/μs 65 V 100 μs 280 mV	0.5 V 1 A/μs 110 V 100 μs 1 V	1 V 0.25 A/μs 280 V 100 μs 1.8 V
Output impedance CV, 0-1 kHz CV, 1-100 kHz	< 0.5 mΩ < 2.3 mΩ	< 1.2 mΩ < 5 mΩ	< 1.7 mΩ < 10 mΩ	< 1.5 mΩ < 12 mΩ	< 1.8 mΩ < 12 mΩ	< 11 mΩ < 90 mΩ	< 34 mΩ < 330 mΩ
Pulsating load max. tolerable AC component of load current f > 1 kHz f < 1kHz	30 A rms 400 A peak	35 A rms 200 A peak	20 A rms 140 A peak	20 A rms 100 A peak	20 A rms 90 A peak	10 A rms 50 A peak	5 A rms 20 A peak

Insulation input / output creepage / clearance input / case output / case	3750 Vrms (1 min.) 8 mm 2500 Vrms 600 V DC
Safety	EN 60950 / EN 61010
EMC Power Supply Standard Generic Emission Generic Immunity	EN 61204-3 , Emission: residential, light industrial environment (CISPR22-Class B) Immunity: industrial environment EN61000-6-3 , residential, light industrial environment (EN55022 B) EN61000-6-2 , industrial environment
Operating Temperature at full load	- 20 to + 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 to + 85 °C
Thermal protection	Output shuts down in case of insufficient cooling
MTBF	500 000 hrs

	SM 15-400	SM 30-200	SM 45-140	SM 60-100	SM 70-90	SM 120-50	SM 300-20
Hold-Up time Vout = 100% , Iout = 100% Vout = 85% , Iout = 100% Vout = 100% , Iout = 50% @ 400 VAC input	11 ms 23 ms 33 ms	11 ms 23 ms 28 ms	11 ms 23 ms 27 ms	11 ms 24 ms 28 ms	13 ms 23 ms 30 ms	13 ms 24 ms 32 ms	12 ms 24 ms 28 ms
Turn on delay after mains switch on	200 ms						
Inrush current	20 A (electronic limit)						
Phase loss	Output shuts down in case of phase loss						

Series operation max. total voltage Master / Slave operation	600 V yes						
Parallel operation max. total current Master / Slave operation	no limit max. 3 units						
Remote sensing max. voltage drop per load lead	2 V						
Limits Voltage adjust range Current adjust range	0 - 102% 0 - 102%						
Potentiometers front panel control with knobs resolution screwdriver adjustment	standard 0.03 % option P001 (at front panel)						
Meters scale voltage scale current accuracy read output read limit setting (d = digit)	3.5 digit 0 - 15.00 V 0 - 400 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 30.0V 0 - 200 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 45.0V 0 - 140.0 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 60.0V 0 - 100.0 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 70.0 V 0 - 90.0 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 120.0 V 0 - 50.0 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 300 V 0 - 20.0 A 0.5% + 2 d 2% + 2 d

Mounting	Stacking of units allowed, air flow is from left to right.						
Input Terminals	Screw Terminals for cable 2.5 - 4 mm ² , 3 phase + earth (no neutral required)						
Output Terminals	M12 bolts	M10 bolts	M10 bolts	M10 bolts	M10 bolts	M8 bolts	M8 bolts
Programming connector	15 pole D-connector at rear panel (FEMALE)						
Cooling audio noise level airflow	Low noise blower, fan speed adapts to temperature of internal heatsink. ca. 56 dBA at full load, 25 °C ambient temperature, 1 m distance ca. 62 dBA at full load, 50 °C ambient temperature, 1 m distance from left to right						
Enclosure degree of protection	IP20						
Dimensions behind front panel: h x w x d front panel: h x w	177 x 443 x 500 mm 177 x 483 mm (19", 4 U)						
Weight	27 kg						



CV= Constant Voltage
CC= Constant Current

Specifications measured at
 $t_{amb} = 25 \pm 5^\circ C$ and $V_{in} = 400V AC, 50 Hz,$
3 phase, unless otherwise noted.

Note: specifications are preliminary,
final specifications may differ slightly.

